# WESTERN CONSTRUCTION NEWS

WITH WHICH IS CONSOLIDATED
WESTERN HIGHWAYS BUILDER

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DECEMBER 15 • 1949

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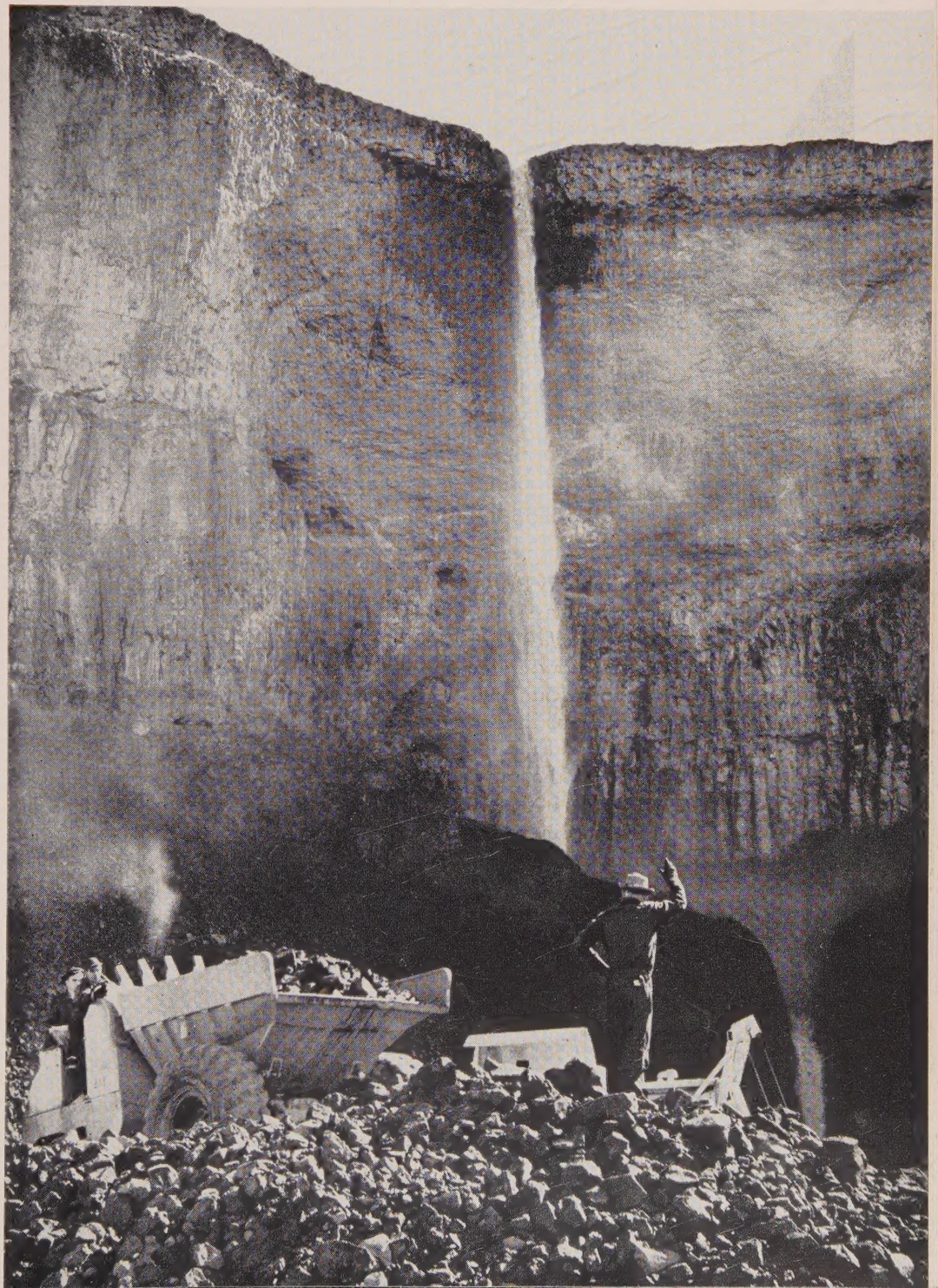
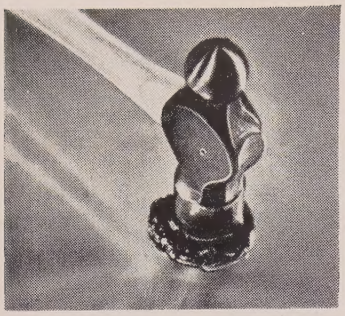


**VOLCANIC ROCK at Devil's Punchbowl is moved by a Koehring Dumptor on the 27-mi. highway relocation around the Equalizing Reservoir for the Columbia Basin Irrigation Project. Strong & McDonald is contractor for this section of the $2-million grading job.**

*USBR Photo.*



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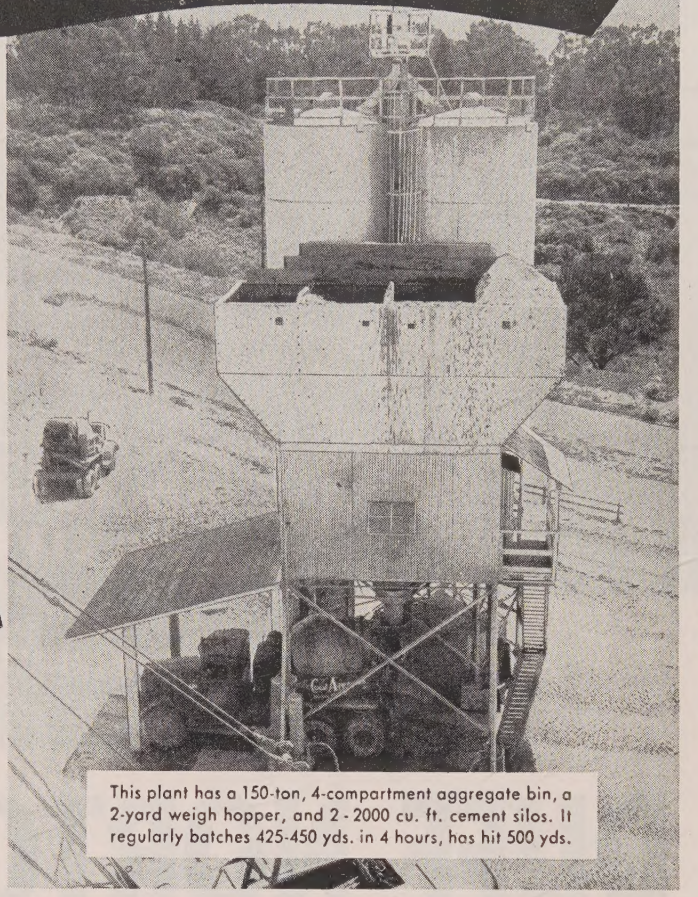
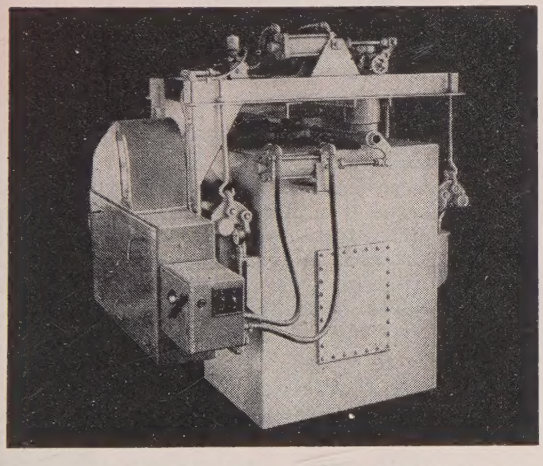


This plant has a 150-ton, 4-compartment aggregate bin, a 2-yard weigh hopper, and 2 - 2000 cu. ft. cement silos. It regularly batches 425-450 yds. in 4 hours, has hit 500 yds.

## NOBLE Water Scales Weigh Automatically



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### EASY TO ERECT, EASY TO SHIP—

The all-welded center section, pioneered by Noble, with automatic batching controls and motor switches in place, enables a 4-man crew to erect your plant in the field and have it in full operation in 3 or 4 days. All units are designed for either truck or rail shipment.

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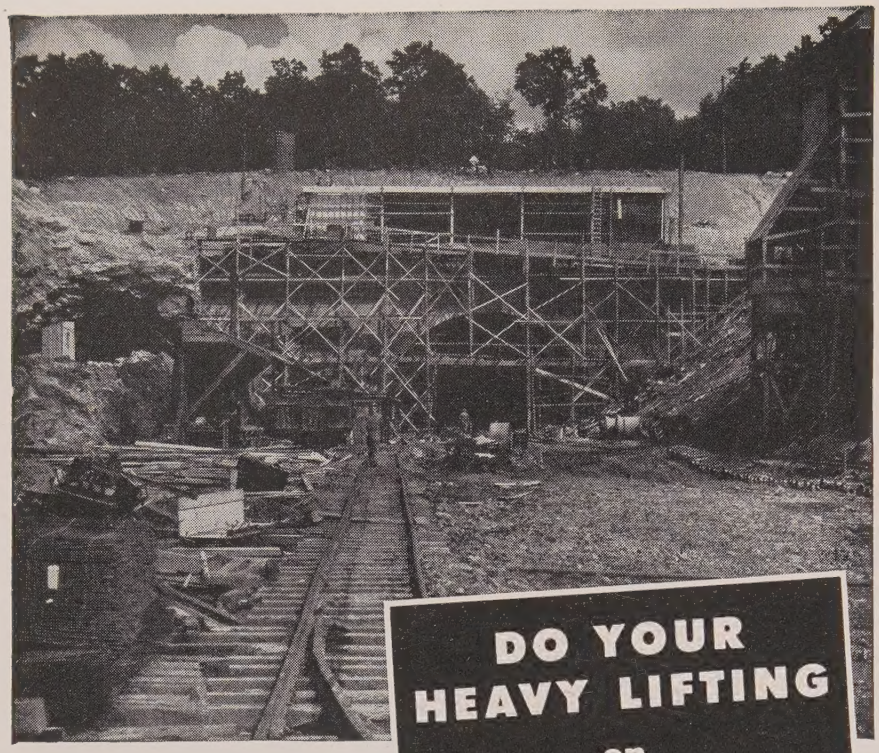

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# Twenty Years Ago..

## Items of Interest from WESTERN CONSTRUCTION NEWS

### December, 1929

A board of consulting engineers an geologists appointed by **Edward Hyat Jr.**, state engineer of California, reporte unfavorably on the site of San Gabri Dam near Los Angeles, and the existin structure was condemned by Hyatt.

●

**John C. Shaw**, city engineer of Lo Angeles, described construction of th 655-ft. Sepulveda Tunnel under Mu holland Highway in Los Angeles. **T. M McDaniel** supervised the constructio for J. G. Donovan & Son.

●

A steep concrete roof slab constructe of gunite was described by **E. R. Hube** assistant engineer with W. L. Hube San Francisco consulting enginee **George Wagner** was the general co tractor.

●

**A. A. Blakesley**, chief engineer of th Merced Irrigation District at Merce Calif., discussed the design and place ment of meters to measure irrigatio water.

●

**J. L. Savage**, chief designing enginee for the Bureau of Reclamation, i spected the foundation and abutmen of Stewart Mountain Dam for the Sa River Valley Water Users Associatio in Arizona, and pronounced the damsit satisfactory.

●

**E. S. Berney**, president of the Nevad Contracting Co., Fallon, Nev., wa elected president of the Northern Cal fornia Chapter of the Associated Ge eral Contractors of America. **Harold Crowell**, Weymouth Crowell Co., Lo Angeles, was named president of th Southern California Chapter of A.G.

●

**S. G. Whittelsey**, consulting engine of San Francisco, described the co struction of modern improvements three small communities that tran formed Pismo Beach into one of th playgrounds of California at a cost $900,000.

●

**R. J. Tipton**, hydrographic engine for the Denver office of the Bureau Reclamation, resigned to take charg of engineering for the State of Colorad on the allocation of waters of intersta streams.

●

**Chester C. Fisher**, construction eng neer with the J. G. White Engineerin Corp. on irrigation projects in Ne Mexico, resigned to become consultin

*Continued on page 44*

# Cost Conscious?

If you're interested in getting more work out of your equipment on less low-cost fuel, with less upkeep, over more profit-making hours . . .

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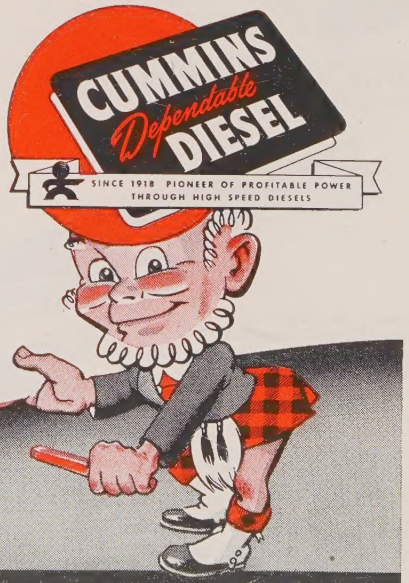


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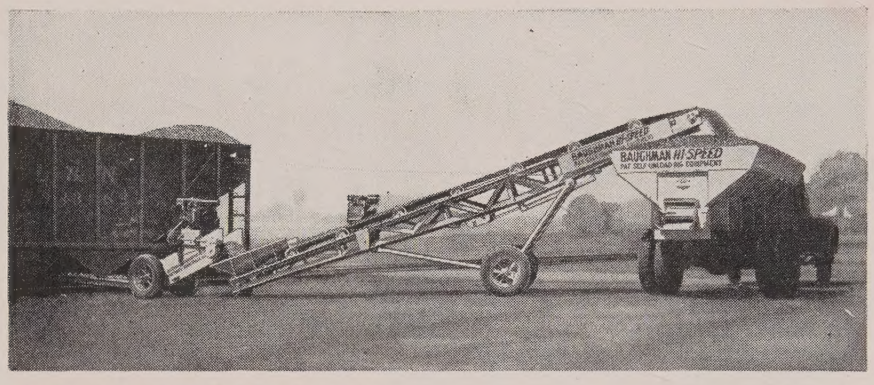
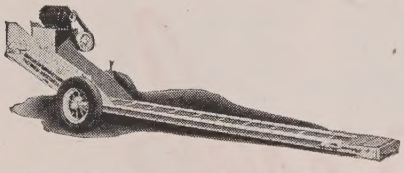
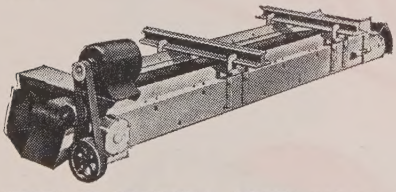
## Conveyor Teams




MODEL 164 OPEN TROUGH BELT CONVEYOR
Shown in use with Model 155 Hopper Car Unloader.



MODEL 155 ARCHED DELIVERY HOPPER CAR UNLOADER. Furnished with steel or drop center rim wheels.



MODEL 190 HORIZONTAL HOPPER CAR UNLOADER. For large users with semi-permanent trackage set-up.

Adaptable to all materials and conditions, Baughman *HI-SPEED* Conveying Equipment is expertly designed to cut handling costs to a minimum. Portable—so that the same Conveyor Teams can be used on several locations—to reduce your equipment costs. Precision-built of the finest quality materials, by expert craftsmen, for years of low-cost, trouble-free service. Baughman *HI-SPEED* Conveying Equipment is competitively priced. We are able to keep our equipment well within the low price range due to our assembly line method of production—and these savings are passed on to you. We welcome the opportunity to discuss your particular problem, without obligation.

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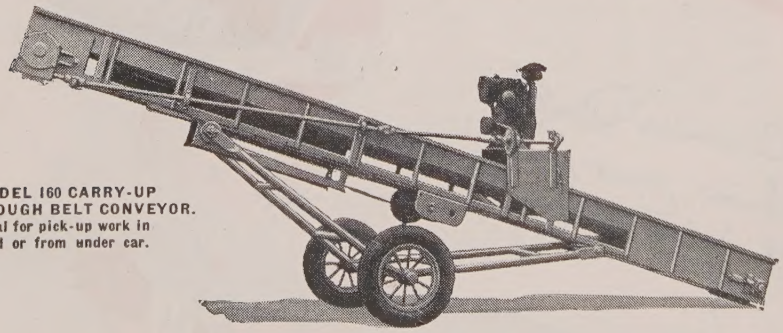

MODEL 160 CARRY-UP TROUGH BELT CONVEYOR. Ideal for pick-up work in yard or from under car.

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# Twenty Years Ago..

*Continued from page 42*

engineer to the Soviet government c irrigation construction in Transca casia.

●

An obituary was published for **Dani A. Garber,** general manager of the A sociated General Contractors of Ame ica. He was one of the organizatio founders and was first president.

●

**Chester A. Smith,** consulting eng neer, Burns-McDonnell-Smith Eng neering Co., Los Angeles and Kans City, discussed the differences betwe separate sludge digestion tanks and t Imhoff-type tank.

●

**R. B. Rothschild, Jr.,** engineer wi MacDonald & Kahn, Inc., of San Fra cisco, described construction of the co crete slab and beam Bosworth Stre Bridge in San Francisco. **Al Rodenbe** supervised the construction for Ma Donald & Kahn.

●

A review of construction was pr sented on Echo Dam, first unit of t Salt Lake Basin Project on the Web River in Utah. **F. F. Smith** was co struction engineer for the Bureau Reclamation.

●

**Harry N. Jenks,** professor of sanita engineering at Iowa State College, r signed to become associated in partn ship with **Clyde C. Kennedy,** consulti civil engineer of San Francisco.

●

**Ray Burgess,** superintendent of pub works at Gilroy, Calif., described co struction of a sewage treatment pla featuring separate sludge digesti tanks at Gilroy.

●

**E. V. Lorenz,** construction engine for the Pacific Power & Light Co., Po land, described construction of a da and hydroelectric plant on the Wallo River in northeastern Oregon.

●

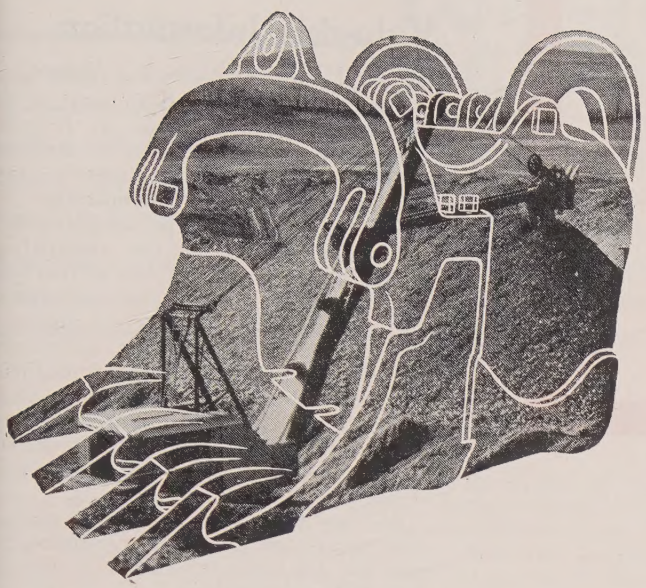
An article on construction of Ju pero Serra Blvd. and Nineteenth Ave. San Francisco described methods us by Eaton & Smith, San Francisco co tractors, that resulted in speedy co pletion of the job.

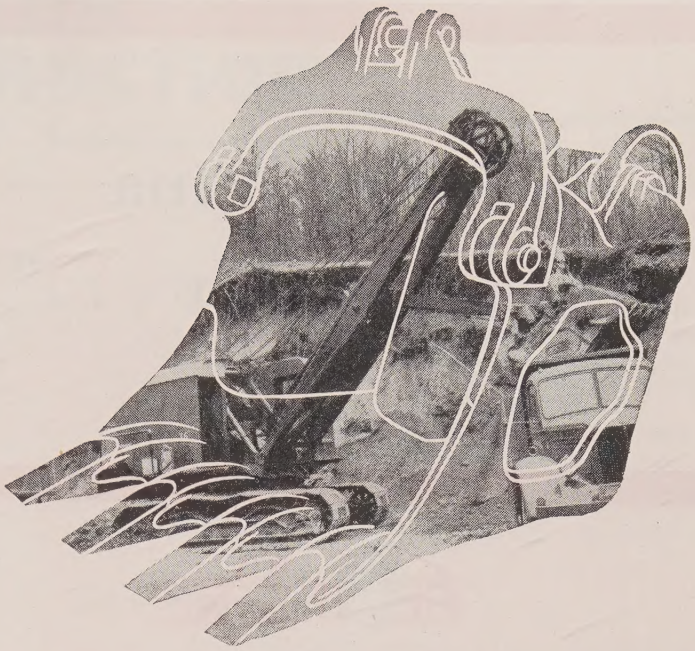
●

Large scale construction of irrigati works in the Brazos Valley of Te was described by **I. G. Wirtz,** engine

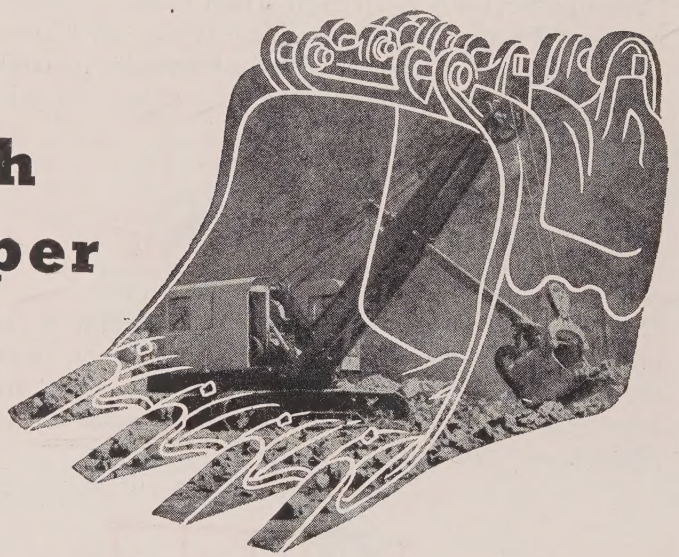
●

Design methods for the easement a banking of highway curves were d cussed by **N. B. Putnam,** civil engin of Salt Lake City, Utah.





# A Good Shovel Works Better with an Amsco Dipper



Made of austenitic manganese steel for resistance to impact, pressure, and abrasion, Amsco dippers also provide the advantages of fast, full loading and quick, complete dumping. Design of Amsco dippers is based on an experience of forty years in fields of power shovel application. To make a good shovel work better, specify an Amsco dipper. Available in all standard capacities, up to ten cubic yards . . . and in types as outlined below.

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A strong, long-life dipper, designed for low overall cost. Patented Amsco construction makes it possible to replace worn lip quickly, holding down-time to a minimum. Teeth are also renewable and reversible.

### AMSCO WELDED TYPE DIPPER

Designed to meet the demand for a strong durable dipper at minimum weight . . . for fast digging and economical use of power. Built in two types: Two Part (½ to 2 yards) and Four Part (2 yards and up); sections are joined by Amsco's patented plug welding process, with all joints overlapped for rigidity. Teeth reversible for double duty . . . and replaceable.

### AMSCO DIPPERS for Special Purposes

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### AMSCO PARTS

AMSCO supplies cast manganese steel dipper and shovel parts, including: teeth, renewable lips, bails, racks and pinions, sheaves, gears, crawler parts . . . as well as a complete line of welding products for hardfacing and reclamation.

For full information on Amsco Dippers and parts—write for Bulletin 547-DS.

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# The Mail Bag..

## Valuable Information

*Editor, Western Construction News*

The article by Jewell Benson in the September 15, 1949 issue of *Western Construction News* is the most complete published information I have seen to date on buried asphalt membrane.

Inasmuch as this type of lining is a new development in the control of canal seepage losses, articles of this type are valuable in getting information to engineers and the construction industry. We, in the Asphalt Institute, are receiving an increasing number of inquiries relative to asphaltic canal linings of all types due to information getting into the hands of engineers and irrigation district superintendents confronted with seepage loss problems.

We feel that within the next two or three years there will be a tremendous increase in both interest and use of asphaltic canal linings.

RODNEY P. RYKER
District Engineer
The Asphalt Institute.
Seattle, Wash.

## Helpful Article

*Editor, Western Construction News*

Congratulations on a good job of coverage in your article on Garrison Dam, November 15, 1949 issue of *Western Construction News.* Articles of this nature not only keep the engineering field advised as to construction methods and progress on these Corps of Engineers projects but, also, are generally helpful in keeping the public informed.

KENNETH P. MIDDLETON
Chief, Technical Information
Missouri River Division
Corps of Engineers
Omaha, Neb.

## Touchy Subject

*Editor, Western Construction News*

Your editorial on California county road construction in the September 15th issue of *Western Construction News* is right to the point and very timely in view of what has been happening recently.

May I comment on another matter too. We were involved in the Matilija Dam controversy in Ventura County, Calif., because we represented the contractors. We followed with interest your handling of that touchy subject, and thought that you did a very fine job of it. While your policy was firm, your suggestions always seemed to be temperate and in the public interest. I know that others involved in the controversy read your articles and editorials on this subject and commented on the constructive point of view expressed.

GARDINER JOHNSON
Attorney, Northern California Chapter
Associated General Contractors
San Francisco, Calif.

WESTERN CONSTRUCTION NEWS
WITH WHICH IS CONSOLIDATED WESTERN HIGHWAYS BUILDER
December 15, 1949 Vol. 24, No. 12

JAMES I. BALLARD . . . . . Editorial Director
JOHN M. SERVER, JR. . . . . Editor
JOHN J. TIMMER . . . . . Managing Editor
RICHARD C. CLARK . . . . . Associate Editor
ARNOLD KRUCKMAN . . . . . Washington Editor

## Build Up the Backlog

FEDERAL FUNDS are again available for financing engineering studies and plans for public works projects. Out of an appropriation of $25,000,000, the eleven Western states' share is $2,109,389 based on a formula weighted heavily with population. This current financing parallels an aid program which ended June 30, 1947, and provides money for interest-free loans requested by states, municipalities and other public agencies to finance the studies necessary to bring proposed projects up to the blueprint stage.

Public officials are frequently handicapped in works planning because the priority of money for engineering preliminaries and the bond issue to provide the money for the project often provide the "chicken-or-the-egg" riddle. Today, this situation is eased again and initiative is the only requirement in adding to the backlog of construction work available for immediate start when local or general conditions demand the stimulus of public works. All elements of the construction industry have a vital interest in this planning program and should unite to aid public officials in advancing projects from proposals to plans. Construction is in a healthy condition only when the backlog of projects is large in volume and well distributed in type.

Recent population growth in the West has demonstrated the need for an increasing volume of public works and the funds are now available for the required engineering work. There should be concerted action on the part of public officials and the construction industry of the West to advance $75,000,000 of new projects to the blueprint stage.

## Comments on NRA

ONCE AGAIN the annual meeting of the National Reclamation Association has passed. Once again the contention raised by Reclamation Commissioner Straus in 1948 that the Association is dominated by a power lobby was again proven false, as more irrigation farmers, water engineers, Chamber of Commerce boosters, and local government officials than ever before met at Salt Lake City to shape the organization's policies. Actually more Bureau of Reclamation employees were in attendance than representatives of the private power companies.

No one could leave the meeting without a greater sense of the importance of irrigation in the American scene; of the sincere concern of the "grassroots" citizen in great national problems; and of the desire among government officials, farmers, engineers, and business men to cooperate in the full development of the West and its resources.

Items of particular interest included the omission of any presentation from the Corps of Engineers, although flood control is one of the charter purposes of the organization; the re-election of vigorous, hard-hitting, sincere Harry Polk of North Dakota as president, and his statement that he is sure the Bureau of Reclamation will name no dams for him; loud and long opposition to Authorities, even from Mike Straus; the time spent by Arizona and California accentuating, rather than composing their differences over the Colorado River; passage of 27 resolutions, all having worthy objectives, but by such a great number reducing the weight of forceful pressure that can be applied to each; and of equal importance, the tabling of one which would by inference have approved the principle of 160-ac. limitation, contrary to the Association's long-standing position.

Spokane was chosen as the site for next year's convention, and a more likely spot could scarcely have been found, located as it is near the world's largest dam, one of the greatest irrigation projects in the world, and in the center of the area presently most threatened by the Authority advocates.

## T-H in Construction

IN ORDER to clarify the relation of the construction industry to the Taft-Hartley Law, the Associated General Contractors and other construction management groups have joined with labor unions active in the industry to request from National Labor Relations Board a blanket exemption from T-H provisions. The provision, for instance, that elections be held to determine the bargaining agency is almost impossible of fulfillment in construction because the men are employed on any one project for such a relatively short period of time that before the results of the election can be certified the job is over.

The right to hire through recognized agencies is also requested, since oftentimes a great number of qualified men are required almost overnight, and there is neither time nor opportunity for the employer to set up and operate an effective personnel agency of his own.

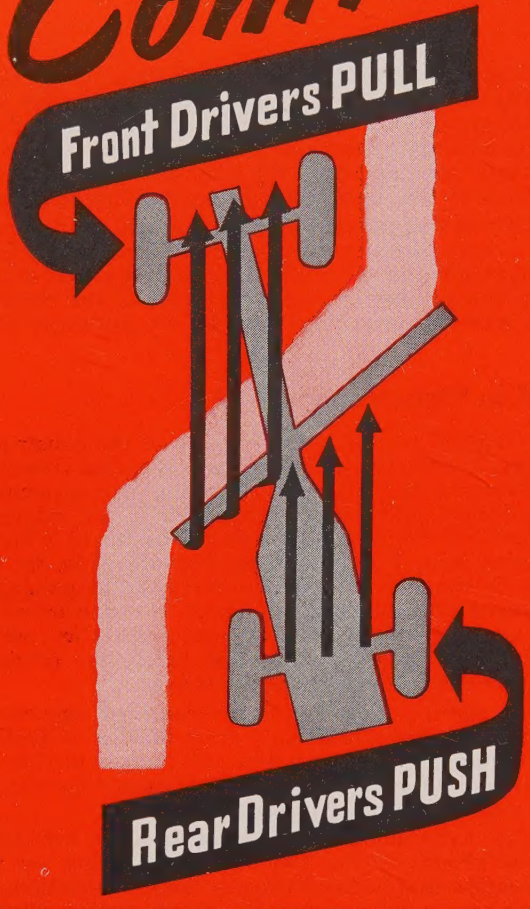
Like many union labor people we are a firm believer in the principles of the Taft-Hartley law, but we have the conviction that in this case, efficiency, production, and harmony can best be served by the exemption requested by unions and employers. A Washington report indicates that NLRB has accepted the request in principle. We hope so.

## A Modern County Shop

COUNTY HIGHWAY operations throughout the West are entering a new period of importance which will emphasize engineering and maintenance work. Not only has the pressure of population increase put heavy demands on these highway organizations but the states are adding requirements which are lifting county road work out of old established ruts. As a result, a new importance has been placed on the servicing and repair of construction and maintenance equipment used by county forces. Too often this valuable machinery has been stored in leaking sheds and repaired in the back rooms of dismal garages. Resulting costs were high, efficiency of operation was low and there was serious lack of morale in the organization.

Such conditions are outmoded, and in their place is coming the type of county maintenance shop and operations described on page 61 of this issue. Lane County, Oregon, serves as an example of this modern trend with its new building providing adequate air and light, modern machine tools, conveyors for handling heavy equipment, and pleasant washrooms. Combined with an office wing having equal proportions and facilities the structure represents an outstanding example of a headquarters building for a modern county maintenance department. Any county road department considering improvements which have as their objective the lowering of equipment maintenance costs and building of morale within the organization can take a lesson from Lane County.

# Controlled Traction




## Moves More Material ...Farther and Faster

Whenever you see an Austin-Western Power Grader in the offset position, shown on this page, you can be sure that it is moving more material farther and faster than any other grader can move it.

"Controlled Traction" is the reason — and controlled traction is possible *only* in a grader with the directional control of All-Wheel Steer, plus the "push-pull power" of All-Wheel Drive.

By offsetting the machine, the operator places front and rear wheels where traction is best, eliminating side thrust at toe or heel of blade, and balancing the whole power of the grader against the load.

**AUSTIN-WESTERN COMPANY, AURORA, ILL., U.S.A.**

With the rear truck in the ditch and the powerful front end up on the road, the grader works steadily and easily in drifted sand, without sliding or stalling.

On road mix, controlled traction makes it possible for all wheels to miss the tremendous windrow of material moving along the entire length of the blade.

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WESTERN CONSTRUCTION NEWS
DECEMBER 15 • 1949

*Record Speed on Embankment Sets Stage for—*

# Construction Finale at Davis Dam

***Many problems have been solved effectively during 3½ years of speedy construction on Davis Dam, Bureau of Reclamation's big Colorado River power structure***

By
HAROLD E. DEAN
Programs Engineer
Bureau of Reclamation
Davis Dam, Nevada

CLIMAXING 3½ years of heavy construction, stop logs were dropped into the diversion openings in the spillway structures at Davis Dam early this month and the newest man-made lake in the arid Southwest began filling with water. Closure of the temporary diversion openings has caused the water to back up to a depth of about 70 ft., forming a lake about 25 mi. long. Eventually, the Davis Dam reservoir will be the 11th largest in the world—67 mi. long, nearly 4 mi. wide, and containing 1,800,000 ac. ft. of water.

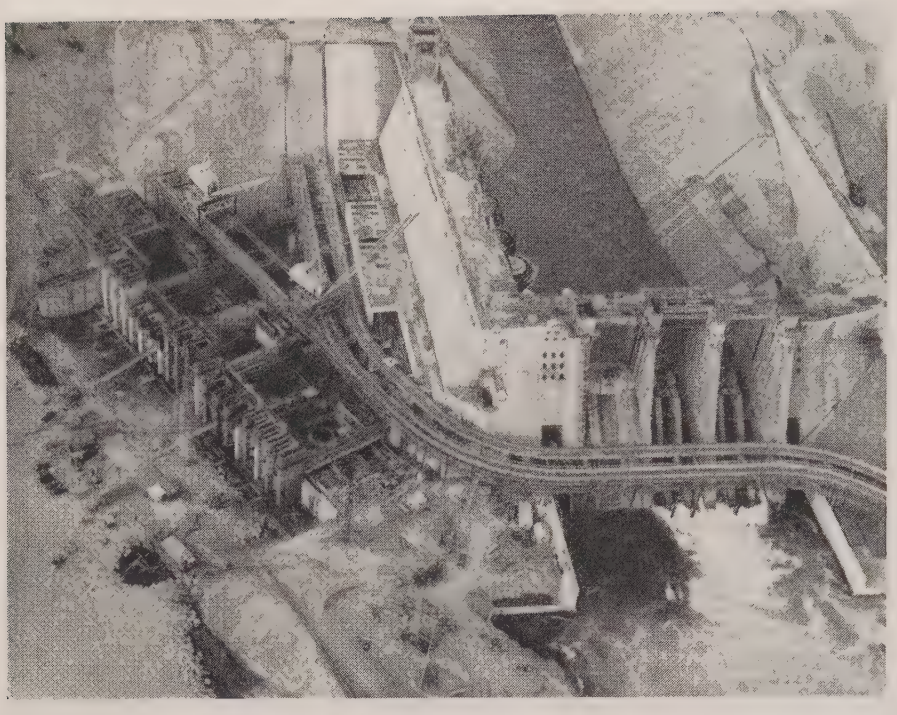
The drop of the stop logs meant that construction is in the final phases on the big power structure located on the Colorado River 67 mi. downstream from Hoover Dam and about 10 mi. north of the point where the boundaries of Arizona, Nevada and California meet. The spillway crest is now being completed, the spillway regulating gates will be installed soon, and concrete work will then be completed.

Meanwhile, construction of the 225,000-kva. powerplant at the dam is being expedited. The first of the plant's five generating units is scheduled to go on the line in November, 1950, with the other four units to follow in quick succession. June of 1951 should see the powerplant in full operation and the entire project completed. Although designed primarily for power storage, the completed structure will also serve to re-regulate the somewhat irregular outflow from Hoover Powerplant and of storing water for irrigation use downstream. This additional storage and regulation will enable the United States to fulfill certain obligations under the Mexican Water Treaty.

### Three-purpose channel

Design features of the dam and construction of the diversion channel around the damsite and terminating at the spillway structure were described in a comprehensive article appearing in the June, 1948, issue of *Western Construction News*. The dam is an earth- and rock-fill embankment rising 200 ft. above the lowest point of the foundation, 1,400 ft. wide at the base end and 50 ft. wide at the crest (see drawing of typical section). The powerplant and spillway are located at the downstream end of a combination diversion, forebay and spillway channel on the Arizona side of the river. The main dam embankment contains a total of approximately 3,800,000 cu. yd. of earth and rock materials, dumped and rolled in layers and made up of several zones of selected materials.

The combination diversion, forebay and spillway channel is an open cut ¾ mi. long, comparatively shallow at the upper end and dropping to a 200-ft. depth near the lower end. The downstream end of the channel is enclosed by a "U"-shaped, gravity-type concrete dam to form the forebay to the powerplant. The right side of this concrete



**AERIAL VIEW of the downstream end of the combination diversion, forebay and spillway channel shows the river flowing through temporary diversion openings in the spillway structure. Powerplant construction is shown at left. Gantry trestle will be removed when main structures are completed.**

dam (looking downstream) is the intake or penstock structure through which the water will pass to drive the turbines in the powerplant. The center section of the "U" is the spillway and outlet structure, located directly across the end of the channel and discharging at an angle into the natural river channel below the dam. The third side of the "U" is a plain gravity wall that serves to complete enclosure of the forebay channel.

The powerplant is located between the intake structure and the original river channel, immediately downstream from the main dam embankment. It is a reinforced concrete structure 114 ft. high and 615 ft. long, containing five 62,200-hp. Francis-type turbines powering five 45,000-kva. generators. An extensive system of power transmission lines, interconnecting the Hoover, Davis and Parker powerplants and extending to load centers in central and southern Arizona, will facilitate delivery of power to power-shortage areas in Arizona, southern Nevada and southern California.

### Record speed on embankment

The Utah Construction Co., main contractor at Davis Dam, began work in March, 1946. The first year was devoted principally to the excavation of the diversion channel and foundations for the intake, spillway and powerplant structures, and to stockpiling rock materials for the dam embankment. This was followed by a period of intensive grouting of the foundation rock for the intake and spillway structures, and of preparations for concrete placement. Large scale concrete placement operations got under way in January, 1948. Six months later, the intake and spillway structures were completed sufficiently to permit the diversion of the river through the new channel and through six 13-ft. diversion openings which had been left in the spillway structure.

In July and August, 1948, following the initial diversion of the river (*Western Construction News*, July, 1948, p. 81), the cofferdams were completed, the foundation area for the dam was unwatered, and the excavation for the dam embankment and for the tailrace channel was started. The first embankment materials were placed during September, 1948, although it was late in October before the cut-off trench under the dam was ready to receive the first layer of impervious fill. In April, 1949, ten months after the diversion of the river, the dam embankment had been completed to its full height. This is believed to be something of a record for the construction of large earth dams. The best monthly progress—770,000 cu. yd. of embankment placed during the month of February, 1949—is the official record for such work on a Bureau of Reclamation project.

While the diversion of the river and the construction of the dam embankment held the spotlight, the construction of the spillway and intake structures was continued, and construction of the powerplant was started. The spillway and intake structures are now substantially completed, except for the spillway superstructure and that part of the spillway crest which was left low to provide diversion openings.

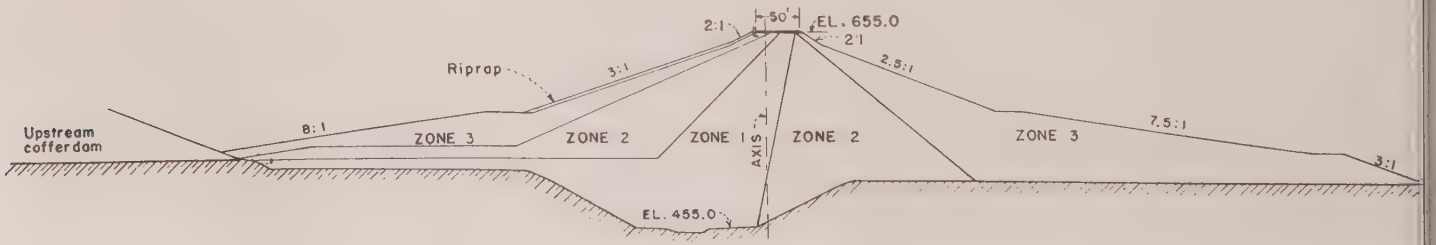
Construction of the powerplant could not start until after the initial diversion and unwatering of the river channel adjacent to the powerplant site. This was accomplished in June and July, 1948, as noted above. Excavation for the powerplant structure was then completed and the rock foundation was thoroughly grouted. Concrete placement was started in January, 1949, and has progressed steadily. As this is being written the powerplant substructure has been completed and the walls are high enough to permit the installation of the embedded parts of the turbines.

### Local materials utilized

Final step in construction of the dam after placement of stop logs in the six diversion openings in the spillway structure will be to complete the spillway crest. The concrete stop logs were dropped, one at a time, into slots prepared for this purpose at the upstream end of the concrete piers which form the diversion openings. This caused the water in the reservoir to rise until it flowed through the two permanent radial-gate openings located one on each side of the spillway. With the second-stage diversion thus completed, the way was opened to place concrete in the stop-logged openings and complete the two remaining sections of the spillway.

The construction schedule calls for the completion of the spillway and installation of the 50-ft. by 50-ft. spillway regulating gates by early February 1950. The schedule also calls for completion of the powerplant structure by units so that installation of the moving parts of the turbines and of the governors and generators can be started at the earliest possible date.

The design of Davis Dam, as for any typical earth dam, is based largely on a study of foundation conditions, availability of materials and comparative costs. At the Davis damsite, the river in ages past had cut a deep channel in the rock which was partially filled with silt, sand and gravel to a depth of about 200 ft. The building of a concrete dam would




**DESIGN of the Davis Dam embankment is not quite typical. An extended impervious zone will force seepage water to travel long distances.**

have required the removal of this material to bedrock and the building of a structure approximately 338 ft. high in order to obtain the desired height of 138 ft. above the stream bed. On the other hand, an earth- and rock-fill dam, properly designed, could be placed on the natural fill in the river channel with relatively little foundation excavation. Furthermore, a good source of material for the impervious zone of an earth dam was found within less than 3 mi. of the site, and rock for the pervious and semi-pervious zones could be obtained quite economically by utilizing the material excavated from the diversion channel and from the foundation excavations for the spillway, intake and powerplant structures.

Typical earth dam design was modified to reduce the rate of percolation of water through the natural river bed material under the dam, and to utilize the materials available. A cut-off trench, 50 ft. deep and 120 ft. wide at the bottom, with 2:1 side slopes, was excavated under the core of the dam. This cut-off trench was filled with compacted material as an integral part of the impervious zone of the dam. This impervious zone was extended as a horizontal blanket over the natural river bed material to the upstream toe of the dam. A glance at the accompanying drawing of the dam section will show how this blanket, and the cut-off trench, will force any water seeping under the dam to travel a relatively long distance.

The design of Zones 2 and 3 of the dam embankment was based on the economical use of the materials available. Roughly half of the rock material excavated from the diversion channel and structure foundations was separated by a grizzly screening plant into sizes of 4 in. and under for Zone 2, and over the 4-in. size for the outer part of Zone 3. This material was screened and stockpiled at the time of excavation, before the diversion of the river. The balance of the excavated rock was stockpiled without screening and was later used in Zone 3 of the dam embankment adjacent to Zone 2 and in the downstream toe of the dam.

### Moisture at borrow pits a problem

All earth and rock materials placed in the dam embankment were hauled from stockpiles or borrow pits by Euclid end-dump and bottom-dump trucks. The rock stockpiles were located within ½ mi. of the fill on the Nevada side of the river and downstream from the axis of the dam. The borrow pit from which the impervious zone material was taken was about 2 mi. upstream on the Arizona side. Trucks were loaded by power shovels without any prior loosening of the material.

Getting the proper moisture content into the desert-dry borrow pit material was quite a problem. Irrigation of the borrow pit prior to excavation helped some, but generally speaking the water did not penetrate very far. Better results were obtained by having a man play a stream of water from a hose onto the material as it was excavated and loaded. And finally moisture was added on the

## System of Well Points and Drains Keeps Cofferdammed River Bed Dry

AFTER diversion of the Colorado River and completion of cofferdams at Davis Dam, water between the cofferdams was pumped out over the downstream cofferdam, initially by a battery of four 10-in. pumps set up on the Arizona bank of the river. A second set of eight pumps mounted on a barge and located over a particularly deep place near the downstream cofferdam went into operation on the second day. The river bed was thus unwatered in five days. Immediately thereafter, the installation of well points began under the technical supervision of the supplier, the J. W. Stang Corp.

The first well points were installed along the toe of each cofferdam. Then, as the excavation of the tailrace channel and the cut-off trench progressed, additional rows of well points were installed at progressively lower elevations. Five rows of well points were used on the upstream slope of the cut-off trench and three rows were used on the downstream slope.

Installation of the well points along the toe of the upstream cofferdam is illustrated above. The valve and connections where a pump is to be placed are shown in the middle foreground. In the background, men and equipment are jetting down an 8-in. casing. A single well point will then be lowered into the casing and the casing will be filled with sand and pea gravel around the well point. Then the casing will be withdrawn and the well point connected to the manifold.

The well points were either installed by means of the 8-in steel casing or were driven by a compressed air pile driver hammer when necessary. A group of well points, usually about 100, was then connected to a header and served by an 8-in. or 10-in. pipe.

The well points were quite successful in drying up the river bed sand over a limited area, but they could not completely dry up the 120-ft. wide bottom of the cut-off trench. To accomplish this, a drain consisting of a 16-in. pipe perforated with ½ x 6-in. slots and covered with a gravel filter was installed in the center of the trench. This drain was sloped toward the Nevada side where it was connected to pumps. Smaller sized French drains were used along the abutments as required. All of these drains were later grouted off with a mixture of sand, cement, bentonite and water.

Altogether, more than 3,300 well points were installed on the slopes of the cut-off trench under the main dam embankment. The well points were removed progressively as the cut-off trench was backfilled with impervious zone material (Zone 1 of the drawing).

PLACING impervious material in the main dam embankment. In this view, the cut-off trench is nearly level full. The fill was placed in 8-in. layers.

fill by sprinkler trucks to obtain the desired optimum moisture content of approximately 12%. Considerable stirring and mixing of the material was necessary in order to evenly distribute the moisture through the material. Various discs, harrows and plows were used, but a tractor-mounted gang plow proved to be the best, largely because it could be raised or lowered by the tractor winch to any desired depth of cut.

The impervious zone material, properly moistened and spread into layers approximately 8 in. thick, was rolled with an average of 12 passes of Bureau-designed sheepsfoot tamping rollers to a 6-in. compacted layer. The Zone 2 material, taken from stockpiles, moistened and spread into layers approximately 15 in. thick, was compacted with an average of eight passes of the sheepsfoot rollers to a thickness of 12 in. The Zone 3 material was dumped and spread into layers up to 3 ft. in depth, but was not compacted except by the traffic moving over it.

The upstream face of the dam above the expected minimum water level was covered with a 3-ft. layer of large rock riprap, which was dumped and bulldozed into place. The sides and bottom of the tailrace channel immediately below the powerplant were covered with a 6-ft. layer of rock.

With the placement of material at the rate of 12 to 18 in. a day, and even faster towards the end, the control of moisture content and compaction was most important. Needle-moisture tests were used in the field prior to the rolling of each new lift, in order to determine whether or not the soil contained the proper amount of moisture, and needle-density tests were made on 50-ft. centers immediately after compaction to determine whether the required compaction had been attained. Field density tests were made periodically, or whenever needle-density tests indicated possible low densities in the fill.

Two types of instruments were embedded in the fill for the purpose of determining the structural behavior of the embankment as well as to obtain data for the design of future dam embankments. Sixty-five piezometers were installed to measure the pore pressure in the dam at various locations. These piezometers have a 1-in. diameter plastic head in which a small porous stone is placed. The heads are attached to two ¼-in. diameter plastic tubes, which run from the heads into a central piezometer

A 2½-CU. YD. power shovel loads a bottom-dump Euclid truck at the impervious material borrow pit 3 mi. from the embankment site. Note workman with hose wetting the material as it is loaded.

# Big Penstocks for Powerplant Fabricated Near Damsite

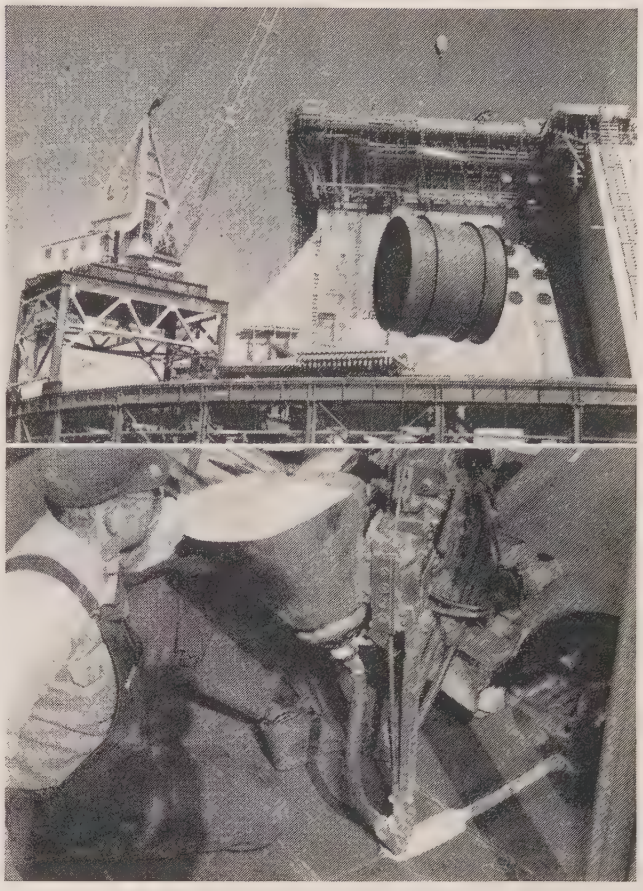
A CONTRACT to furnish, fabricate and field-weld the girth joints of the 22-ft. diameter welded steel-plate penstocks at Davis Dam was awarded to the Southwest Welding and Manufacturing Co. of Alhambra, Calif., in August, 1948. Pipe sections for the penstocks were necessarily of various lengths, from approximately 10 to 30 ft., and a considerable number of sections were bends. The heaviest single pieces were the 10 expansion joints, which weigh approximately 45 tons each. These are believed to be the largest expansion joints ever made.

Since steel pipe of 22-ft. diameter could not be transported over either railroads or highways, it was necessary for the contractor to set up a field fabrication plant near the dam site. The ¾-in. to 1-in. thick steel plates were rolled, cut to exact size and bent to the proper degree of curvature at the firm's Alhambra plant before shipment. At the field fabrication plant, these plates were fitted together to form complete sections of pipe and were welded by Union-Melt automatic welding machines. Every foot of weld was X-rayed to insure perfection.

Illustrated (top) is a section of the 22-ft. diameter penstock pipe being swung into position by the gantry crane. View at bottom shows the Union-Melt automatic welding machine in action fitting together two sections of the pipe.

The field fabrication plant, located on the Nevada side about ¾ mi. below the dam site, was largely an outdoor affair, complete with make-up jigs, cranes, a guy derrick, portable welding machines, etc. One small building served as office, shop and X-ray laboratory. Little working time was lost due to not having a roof over the entire plant.

The penstocks were installed by J. P. Pomeroy and Sons, sub-contractor to The Utah Construction Co. Final welding of the girth joints was then done by Southwest Welding and Manufacturing Co.



well located at the downstream toe of the dam. In this well are placed gages so the pressure at each piezometer can be measured.

Three settlement gages were installed in the embankment to measure the settlement at various depths. These consist of horizontal cross arms of angle iron welded at right angles to short sections of 1½-in. pipe, embedded in the embankment as it is placed. These sections are telescoped with short pieces of 2-in. pipe, the smaller pipe fitting loosely into the larger pipe in a vertical column extending from the bottom to the top of the embankment. In use the position of the bottom of each section of 1½-in. pipe is measured with a steel tape to which is attached a "torpedo" with retractable fins. The torpedo is lowered through the column of pipe and pulled up so that the fins contact the lower end of each small section of pipe. A mechanism at the bottom of the installation trips the fins so that the torpedo can be withdrawn after the measurements have been made.

### Generators through powerplant roof

The Davis Dam Powerplant is a semi-outdoor plant; the tops of the generators will project through the roof of the structure a short distance. Each generator will be protected from the weather by a removable metal cover. A 325-ton capacity gantry crane will travel on the roof of the structure and straddle the generators. This design is unusual but not entirely new. The principal advantage is the saving of construction costs—a smaller building to construct. Even so the heavily reinforced concrete structure will rise 114 ft. above the rock foundation.

The powerplant is located on the Arizona side of the river, between the original river channel and the new diversion and forebay channel. In normal operation the entire flow of the river will pass from the forebay, through the five 22-ft. diameter steel penstocks, through the turbines, into the tailrace and thence to the original river channel.

Each unit of the powerplant structure will be separated from the other units and from the service bay at the north end and the control bay at the south end by mastic joint filler so that any settlement or other movement in any part of the structure will not crack or tilt the other parts. During construction, this means that each unit is, in effect, built separately from the other units—alternate units, Nos. 1, 3 and 5 are carried as high blocks, with the service bay, units 2 and 4, and the control bay as low blocks. When the structure as a whole nears completion, it will be necessary to finish the service bay first, then the units in numerical order, and finally the control bay, dismantling a portion of the construction trestle as each unit is completed.

The original construction contract, as awarded to The Utah Construction Co., called for the construction of the powerplant structure only without any installation of turbine or generator parts. It was contemplated that the turbines and generators would be installed by Government forces, working in close cooperation with the contractor so that the contractor could place the second-stage concrete around the scroll cases, etc. Later developments, particularly limitations and restrictions imposed on work by Government forces, made certain changes necessary. An extra work order was issued to The Utah Construction Co. for installation of the embedded parts of the turbines, permitting the contractor to complete all major items of concrete work and to finish the powerplant structure.

### Organization

Davis Dam is being constructed by the United States Department of the Interior, Bureau of Reclamation, under the direction of Michael W. Straus, Commissioner; L. N. McClellan, Chief Engineer; E. A. Moritz, Regional Director, Region III. H. F. Bahmeier is Construction Engineer, Jean R. Walton, Field Engineer and Harold R. Orr, Office Engineer at the construction site. Field forces of the contractor, The Utah Construction Co., are headed by H. E. Williams, Project Manager; T. L. Terry, General Superintendent, and Paul Newell, Project Engineer.

# Holes Drilled to 130-ft. Depth for Blasting Rock on Idaho Highway Job

***A pattern of long holes drilled from two-way slots in steep canyon walls eliminated excessive scaling time and reduced drill-hole footage and powder requirements***

By
R. P. COMSTOCK
General Superintendent
R. S. McClintock
Spokane, Wash.

A SYSTEM of long-hole drilling and blasting, with holes as deep as 130 ft. in hard granite, has proven its merit on the removal of solid rock in place for construction of a short stretch of highway in Idaho through particularly difficult terrain. From vertical keyways cut into the cliffs of a canyon wall, a pattern of long holes was drilled to enable blasting of a great volume of rock from these centralized locations. A good comparison was possible on the job between long-holing and straight wagon drill rounds. Major advantages gained by this unique type of drilling included: (1) elimination of excessive scaling and sloping time, and (2) reduction of drill-hole footage and powder necessary per cubic yard of rock broken.

The section of road is on Idaho State Highway No. 9, approximately 45 mi. east of Kooskia in west central Idaho. It will provide another link in the highway that will someday connect Missoula, Mont., with Lewiston, Ida., as well as Boise and all areas between and west thereof. Eventual completion of this new link in a trans-continental highway was formulated in the minds of many Idahoans a number of years ago. Also the Northern Pacific and Milwaukee railroads vied to obtain a right-of-way following the same route. Later, both railroads abandoned the idea and, in 1935, the U. S. Bureau of Public Roads renewed interest in the project. At that time, the road ended some 15 mi. from Kooskia.

In 1936, a Federal prison camp was erected about 8 mi. east of what is now Lowell, Ida., for the purpose of supplying construction labor. The first section of the road was started in 1937, using the prison labor, with supervisory and engineering personnel supplied by the Bureau of Public Roads. Up until 1947, the road construction was a straight Federal-financed project. Since then, it has been a Federal Aid Project with the State of Idaho taking over from the Bureau.

The present 1.14 mi. of construction is in what is known as the Black Canyon of the Locksa branch of the Clearwater River. Contract for the construction was let to Tony Marrazzo of Boise, Ida., for approximately $230,000. The job involved removal of 120,000 cu. yd., the majority as solid rock in place. Als necessary was an extensive chann change in the river involving 26,000 c yd. of excavation. R. S. McClintock Spokane, Wash., sub-contracted fro Tony Marrazzo for the rock breaking c the entire job.

**THIS SOLID ROCK FACE** confronted the contractor at the beginning of the job. The road right-of-way was blasted through similar cliffs for more than a mile. Note the wagon drill set-up at the bottom of the cliff, ready to drill a pattern of the long holes.

### Slots excavated from a raft

For drilling the rock cliffs, McCli tock employed a system of long-ho drilling and blasting. Drilling slots (c keyways) were cut into the vertic cliffs at about 180-ft. intervals. This di ficult job was accomplished by the on possible means—from a raft in the riv below. The slots were cut with Inge soll-Rand J-50 Jackhammers, and th broken rock was then removed with double-drum Gardner-Denver slush mounted on the raft. The slots were c at locations in the rock face that i volved the least amount of excavatio with proper regard for the practic drilling distance between slots.

For a two-machine set-up enablin drilling in both directions, the slots ha to be made 25 ft. long for the enti width of the rock face. Also, they had t be cut 3 ft. inside of the ditch line (s drawing) and 2 ft. below grade in ord to have working room for the drills.

As soon as the slots were readied, I gersoll-Rand X-72 wagon drills were s up for drilling a pattern of long holes both directions. The wagon drills we secured on horizontal bars supported c columns of 3-in. steel. The columns we set in 4-in. holes drilled with jackha mers and using sulphur as the retainin material because of its quickness setting.

### Four bits for a 120-ft. hole

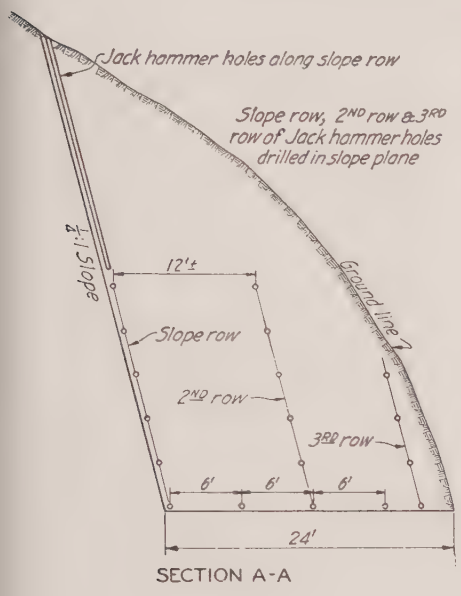
Holes were drilled as deep as 130 using 5-ft. sectional steel with a wat swivel specially designed for pneumat drills. An average of approximately 1 ft. per machine shift was drilled. Th was not an exceptional footage, f wagon drill work, but the tonnage pr pared for shooting per foot of hole f exceeded customary wagon drill oper tion.

Ingersoll-Rand Carset 2-in. bits we used to start all holes and were gauge down so as not to have any hole und 1¾ in. This procedure enabled loadin to be done with 1½ x 12, 60% Dupo Gelatin powder. By the use of carbo tungsten insert bits, rods in a 120-ft. ho had to be pulled and a bit changed on

4 times in order to complete the hole. Footage obtained from the Carset bits ranged between 25 and 30 ft., depending on the hardness of the granite.

Loading of the holes was accomplished by the use of 6-ft. jointed loading sticks with a 2-man crew capable of loading 700 to 800 ft. during an 8-hr. shift. Reinforced Primacord-Bickford was used for double priming and as a precaution against cut-offs in the holes.

For the straight wagon drill rounds used along the slope lines (see drawing), Dupont Special Gelatin, both 40% and 60%, was used. On these rounds, a powder factor of about ¾ lb. per cu. yd. of broken rock was obtained. For the long-hole rounds, the powder factor was dropped to ½ lb. per cu. yd. As an example, one shot broke 9,000 cu. yd. with 3,600 ft. of long-hole drilling. Approximately 5,000 lb. of the Dupont gelatin powder was used for the shot.



SECTION A-A

### Like a knife-slice

Many other advantages were apparent using the long-hole system of drilling. By centralizing drilling in a few slots, a great deal of rock could be drilled and blasted ahead of the hauling operations. Much less footage of drilled holes was necessary per cubic yard of broken rock. When the long holes were blasted, the slope line was left as if a knife had sliced the road cut from the cliffs.

Air for the pneumatic drills was supplied by one 500 Ingersoll-Rand and one 315 Schramm compressor. The two machines both tied into 3-in. hose laid above the slope line for the length of the job and with manifolds at necessary places. The 3-in. air hose was made from thin wall tubing with welded ends cut for Victaulic couplings. This made the air line very light and easy to install over the hazardous territory. For the ditch line drilling, a 105 Sullivan compressor, driven by a Fairbanks-Morse engine, and mounted on a truck, was used because of its maneuverability.

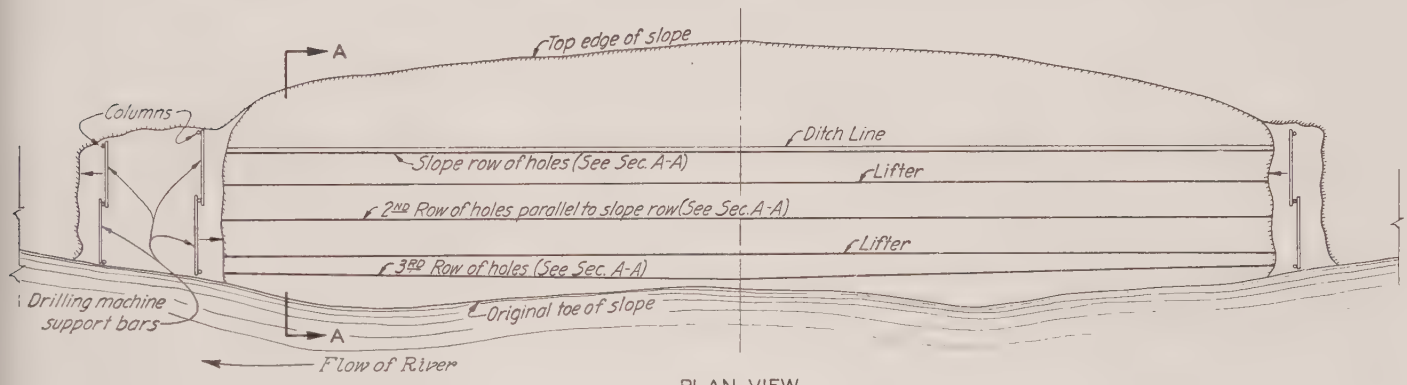
### Survey reference line

The problem of maintaining survey stations and reference points on the canyon walls was solved by E. E. Montgomery, resident engineer for the Idaho State Highway Department. A center line of points could not be installed and kept in place during the construction. Instead, a reference center line was laid out parallel to the actual one. A system of triangulation was established and referred to whenever needed during construction.

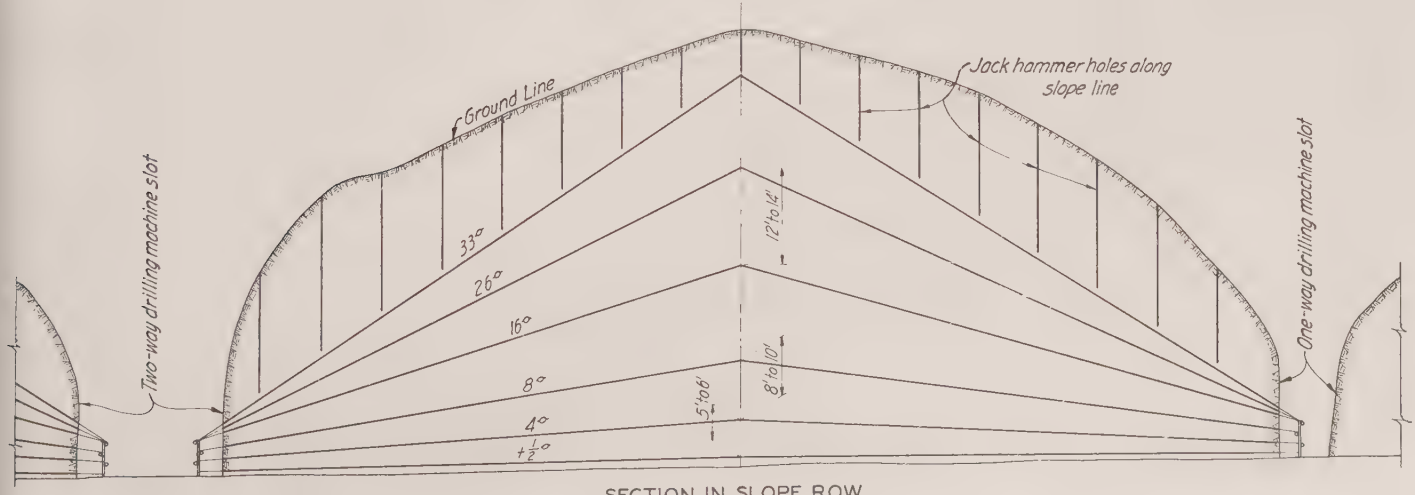
The State of Idaho kept a crew of 4 to 8 men on the job. Harold Miller, superintendent for Tony Marrazzo, employed a crew of about 15 men. R. S. McClintock kept about 20 men on his payroll.

A camp was set up in the old prison barracks previously mentioned. These were outfitted with running water and electric lights and made a comfortable residence for the crews.

**PLAN AND SECTION drawings for a typical pattern of the long holes. Distance between the drilling slots in this case was 180 ft., nearly the maximum possible with proper regard for practical drilling distances. Note that jackhammer holes along the upper portion of the slope line combined effectively with the long holes.**



PLAN VIEW



SECTION IN SLOPE ROW

## *The $70,000,000 Weber Basin Project Will Be—*

# Utah's Biggest Water Development

***Construction of an extensive system of dams, canals and power plants will develop all the available water supply of the 2,500-sq. mi. Weber Basin area in Central Utah***

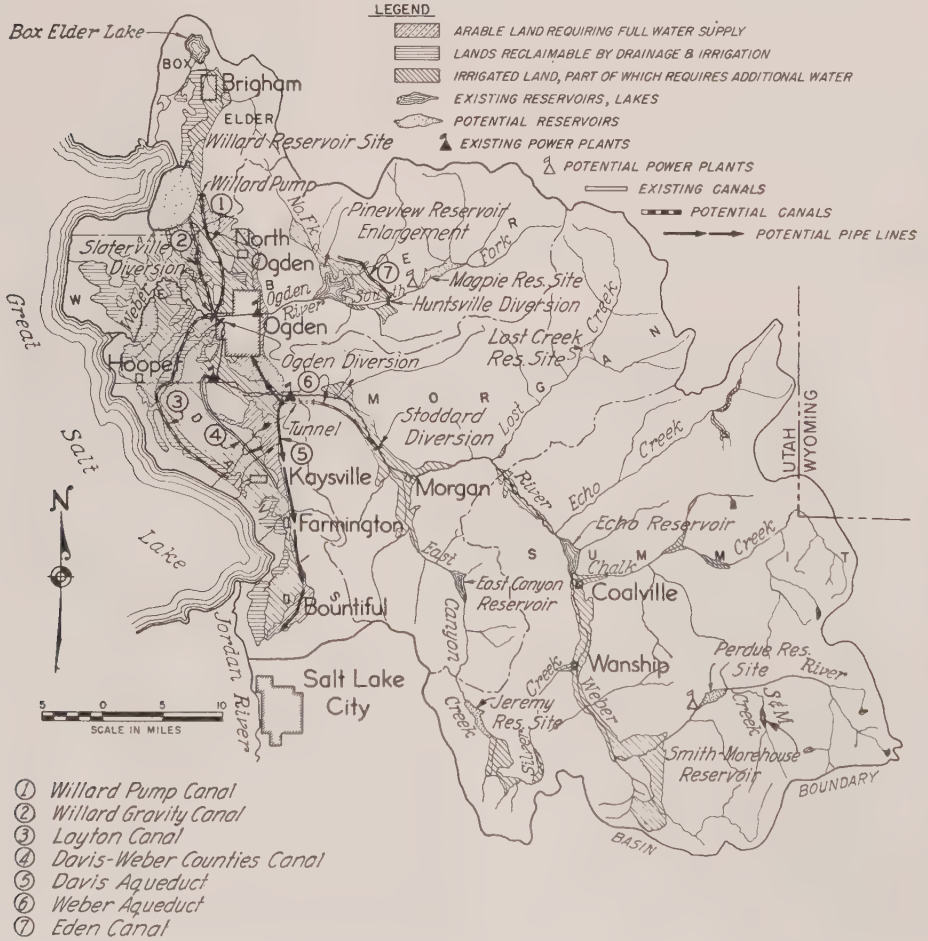
A PROJECT somewhat smaller in magnitude, but no less impressive in scope and technology than the Central Valley Project of California, the Columbia Basin Project of Washington, or the Colorado-Big Thompson Project of Colorado, is the recently authorized Weber Basin Project in Central Utah. This first published report of the scheme to make full use of the waters of the Weber River and its tributaries for irrigation, municipal purposes, power, flood control, and recreational development is compiled from the report of O. E. Larson, Regional Director of the Bureau of Reclamation at Salt Lake City, to the Commissioner of Reclamation in Washington. The project would be the largest comprehensive development plan in the Utah region.

Estimated cost of the project at 1949 figures, according to Larson, would be nearly $70,000,000. It would irrigate 70,400 ac. of now barren land, and would supplement inadequate present water supplies to another 30,000 ac. Some 40,000 ac. ft. of water annually would be available to supplement present municipal uses, and lands threatened annually by flash floods would be permanently protected. These ends would be achieved through construction of five new reservoirs and enlargement of an existing one, along with a system of diversion dams, powerhouses, canals, pipelines, tunnels and drainage facilities.

### All available water to be used

The Weber Basin covers an area of approximately 2,500 sq. mi., with a narrow strip of land between the western front of the Wasatch Range and the Great Salt Lake being the area principally to be benefited, although some narrow tracts of cultivated or irrigable lands lie along the mountain valleys and on adjacent benches. The above mentioned strip of land along the lake shore averages about 7 mi. wide and extends from Brigham on the north, almost to Salt Lake City on the south, a length of approximately 50 mi.

**A STRIP of land near the Great Salt Lake will receive the principal benefits of the basin-wide development program. Major features of the program are mapped below.**




About 50 years ago all the stream flow in the area, except spring flood flow, was appropriated, this amounting to roughly 60% of the total available water. The balance simply wasted into Great Salt Lake. In drought years, the appropriated water was sharply curtailed and total crop failures occurred. Much of the farm land suffered shortages every year. To reduce the shortage, three reservoirs have been built—East Canyon in 1896 (enlarged in 1916), Echo in 1929 (*Western Construction News*, Dec. 10, 1929, p. 639), and Pineview in 1936 (*Western Construction News*, April, 1937, p. 154). These have a combined storage of 150,000 ac. ft., but do not conserve all of the flood flows.

The proposed plan of the Reclamation Bureau will develop all of the basin's available water supply by further storage regulation of the fluctuating flows of the Weber River, the Ogden River, the Weber's principal branch, and other tributaries; the development of usable return flows and ground water; and drainage of some 38,000 ac. of presently waterlogged land.

### Features of the plan

The basic plan includes a system of four new upstream reservoirs: Perdue, Salt Creek, Jeremy, and Magpie; enlargement of the existing Pineview reservoir; and construction of one off-stream reservoir (Willard) on the shore of Great Salt Lake, for a total additional storage of 213,000 ac. ft. The upstream reservoirs would meet the irrigation and municipal requirements of the higher level lands. Flows not regulated by these reservoirs, winter power releases and return flow from lower areas would be directed into Willard reservoir, a broad shallow area to be restrained by dikes and having a capacity of 205,000 ac. ft. From this pool, water will be pumped onto the desired irrigable lands. Maximum pump lift at Willard reservoir would be 80 ft.

Delivery of water to the high level land would require three new conveyance systems: Eden canal and the Weber and Davis aqueducts. Eden canal would divert water from below Magpie reservoir on the south fork of the Ogden River about 5 mi., to serve lands in Ogden Valley. Weber aqueduct, 19 mi. long, would divert Weber River water 4 mi. below Morgan and extend along the south bank of the Weber canyon to its mouth, then cross the canyon and extend northward along the bench lands. Davis aqueduct would take water from the Weber aqueduct at the mouth of the

canyon and convey it 23 mi. along the foothills to the south end of the area.

To furnish water to low level lands, 3 main canals, 2 diversion dams, and 2 pumping plants would be required. Virtually all flow of the Weber River would be diverted at Slaterville diversion dam a short distance below the mouth of the Ogden River, and conveyed 11.5 mi. through Willard gravity canal to Willard reservoir. From the latter it would be pumped to the Willard pump canal, extending another 11.5 mi. to the Weber River channel to serve all low-lying lands in the intervening area. The Layton Canal would divert Weber River water at Ogden diversion dam and extend 20 mi. south to Kaysville, serving low lands in that section. Water for this latter canal would be secured from the flow of the Weber River, supplemented by Willard pump canal water lifted 20 ft. by the Layton pumping plant.

### Private power plants affected

Hydroelectric power would be generated at Perdue and Magpie reservoirs, with a total installed generating capacity of 6,000 kw., and the plants would be interconnected with the power system of the Utah Power and Light Co. Pumping power required from the project would be obtained from the company through exchange agreements. Generation would exceed pumping uses slightly.

Construction and operation of the project would affect three existing plants of the power company. Their Pioneer plant on Ogden River would receive an increased production of about 3,000,000 kw. hr. annually, but their Riverdale plant on the Weber River would be cut about 5,000,000 kw. hr. per year. Their Weber plant would be very slightly affected. The proposed plan is to reimburse the company by a lump sum payment for their losses at Riverdale and charge them on an annual basis for the increase at Pioneer.

About 115 mi. of open drainage channels and wasteways would be required to reclaim and make suitable for productive irrigation farming some 39,000 ac. of low-lying and waterlogged land.

The Regional office of the Bureau of Reclamation, after preparing this plan, carried out on paper a simulated operation of the scheme for the 20-yr. period, 1928 to 1947, to prove that an adequate water supply would be physically available for the project as planned. Municipal uses were given first consideration, and all these requirements were fully met. Minor irrigation shortages of less than 10 per cent would have occurred, it was found, in the dry years of 1931, 1934 and 1935.

The capital cost is tentatively estimated at nearly $70,000,000, and annual operation and maintenance costs at $275,000, divided by principal features as follows:

| | Construction Cost | Operation and Maintenance |
|---|---|---|
| Perdue Reservoir | $ 9,400,000 | $ 6,000 |
| Enlarged Pineview Reservoir | 2,450,000 | 4,000 |
| Jeremy Reservoir | 3,400,000 | 5,000 |
| Lost Creek Reservoir | 3,550,000 | 5,000 |
| Magpie Reservoir | 9,350,000 | 6,000 |
| Willard Reservoir | 11,000,000 | 4,000 |
| Four diversion dams | 1,000,000 | 2,800 |
| Weber Aqueduct | 7,000,000 | 4,800 |
| Davis Aqueduct | 9,800,000 | 5,300 |
| Four canals | 2,550,000 | 20,200 |
| Two power plants | 1,500,000 | 82,900 |
| Four pumping plants | 2,500,000 | 62,700 |
| Drainage system | 3,000,000 | 17,000 |
| Lateral system | 1,400,000 | 5,000 |
| Compensation to U.P.&L. | 300,000 | — |
| Miscellaneous | 1,800,000 | 44,300 |
| | $70,000,000 | $275,000 |

### Repayment of costs

It is planned that a 60-year repayment period for irrigation users, and a 40-year period for municipalities, would repay construction costs. Municipal payments would continue to be at the same rate for the extra 20 years in lieu of interest payments. Irrigation charges would amount to about 92¢ per ac. ft. for construction and 47¢ per ac. ft. for O. & M. on dairy-field crop land annually; $1.72 to $1.94 for construction and 91¢ for O. & M. on dairy-cash crop land; and $3.15 for construction and 91¢ for O. & M. on fruit and truck lands. Municipal charges would amount to $11.72 per ac. ft. for construction and 54¢ for O. & M. Total estimated revenues over a 60-year period are:

| | |
|---|---|
| Irrigation water | $30,102,000 |
| Municipal water | 28,116,000 |
| Power | 1,626,000 |
| | $59,844,000 |

The balance of the capital cost would be absorbed by non-reimbursable benefits including flood control, fish and wildlife, and recreational improvements.

A brief description of the principal construction features follows:

**Perdue Dam,** on the main stem of the Weber River 6 mi. above Oakley, would be a rolled earth and rock-fill structure 210 ft. high with a crest length of 1,300 ft. It would create a reservoir of 50,000-ac. ft. capacity, have a spillway on the right abutment of 7,800-sec. ft. capacity, and an outlet works with minimum discharge of 1,000 sec. ft.

The enlargement of **Pineview Dam** on the Ogden River 8 mi. east of Ogden would raise the present 61-ft. high earth-fill structure by 23 ft., increasing the reservoir capacity from 44,200 ac. ft. to 92,500 ac. ft. Spillway and outlet works would be altered to meet the new requirements.

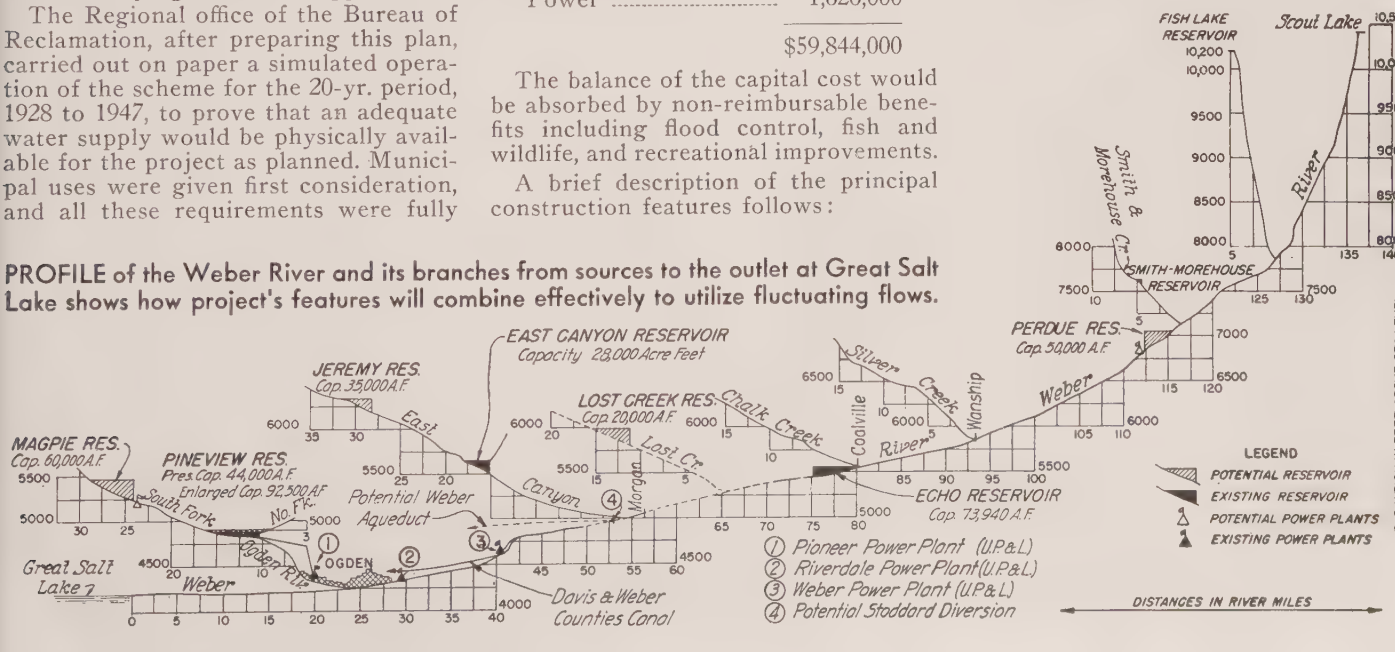
**Jeremy Dam** on East Canyon Creek would be a rolled earth and rock-fill dam 150 ft. high and 730 ft. long at the crest. The spillway over the left abutment would have a discharge capacity of 2,500 sec. ft. and the outlet works a capacity of 600 sec. ft. Normal storage capacity would be 35,000 ac. ft.

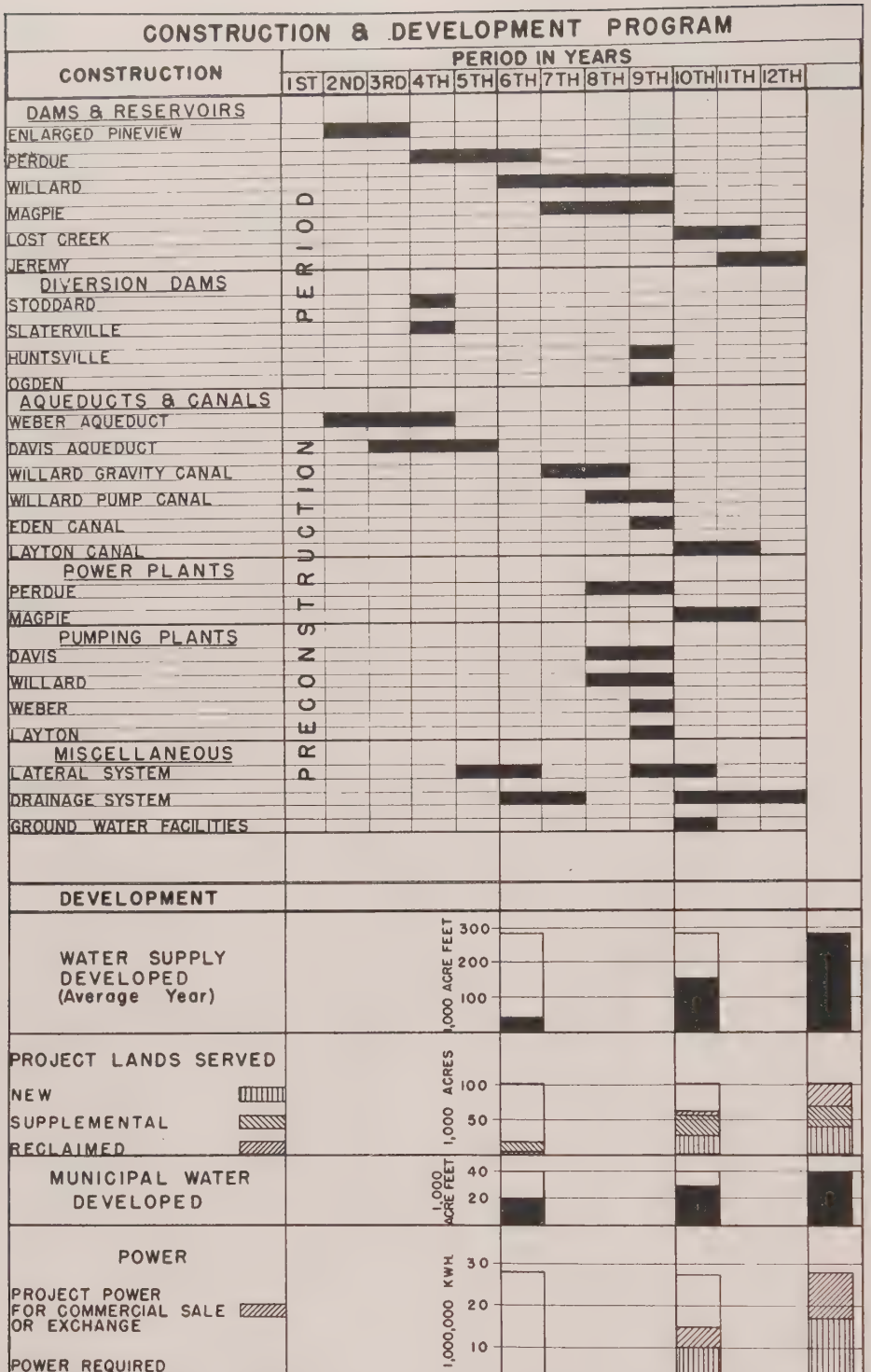
**Lost Creek Dam,** on the creek of that name about 12 mi. above its confluence with the Weber River, would create a reservoir of 20,000-ac. ft. capacity. It, too, would be an earth and rock-fill structure 180 ft. high and 1,020 ft. long. The free-flowing spillway would accommodate flows of 6,000 sec. ft. and the normal outlet works is designed for 600 sec. ft.

**Magpie Dam** on the South Fork of the Ogden River, 18 mi. east of Ogden, would be a similar type of dam, rising 260 ft. above stream bed, with a crest length of 895 ft. The outlet works would release 800 sec. ft., and the spillway is designed for 4,150 sec. ft. Total storage would be 60,000 ac. ft.

**Willard Reservoir,** about 1 mi. west of Willard, would be located in a large mud flat and marshy area known as Willard Bay, presently a section of Great Salt Lake. It would inundate approximately 11,000 ac. of old clay lake bed. This clay is water-laid and well compacted. Preliminary tests indicate it would be water-tight. It would be

**PROFILE of the Weber River and its branches from sources to the outlet at Great Salt Lake shows how project's features will combine effectively to utilize fluctuating flows.**






**THE PROJECT would be constructed over a 12-yr. period in accordance with a program that would make water available at the end of the 5th, 9th and 12th years.**

surrounded by a dike 12.8 mi. long with a maximum height of 30 ft. One section of dike would be for the purpose of protecting the Union Pacific R. R., which passes along the east side of the reservoir site, but the main dike would separate the reservoir from the lake. The spillway would pass 3,000 sec. ft. The outlet works would consist of a 500-sec. ft. sump canal excavated in the floor of the reservoir to convey water to the intake of the Willard pumping plant.

The **four diversion dams** would be reinforced concrete ogee overflow weir sections and canal headings. Stoddard Dam, on the Weber River 4 mi. north of Morgan, would divert 435 sec. ft. to the Weber aqueduct; Ogden Dam, near Ogden, would divert 165 sec. ft. into the Layton canal; Slaterville Dam, 1,000 ft. below the confluence of the Weber and Ogden rivers, would divert 800 sec. ft. into Willard gravity canal and a maximum of 325 sec. ft. into the existing Hooper canal; and Huntsville Dam, on the Ogden River 3 mi. east of Huntsville, would divert 60 sec. ft. into Eden Canal.

The project would be constructed over a 12-year period in accordance with a program which would make water available in three blocks at the end of the fifth, ninth and twelfth years, approximately 40,000 ac. ft. annually at the end of the first stage, 120,000 ac. ft. at the termination of stage II, and 285,000 ac. ft., the full flow, at the end of construction.

The preparation of the report was carried out by the Regional office of the Bureau of Reclamation in Salt Lake City, of which Mr. Larson is Regional Director, Reid Jerman is planning engineer, and F. M. Warnick is area engineer in charge of investigation. The plan was reviewed by the National Park Service to appraise the recreational potentialities; the Fish and Wildlife Service to assess benefits in its field, and the Public Health Service conducted a sanitary survey to evaluate public health problems which might be encountered. Data on flood damages and frequencies were secured from the Corps of Engineers.

The project was authorized in October by Congress and the President, although the latter indicated dissatisfaction with some phases of the project as he signed the authorization (see *Western Construction News* editorial page, Oct. 15, 1949, issue). No appropriations have yet been made for construction.

## Montana Maps Extensive Highway Modernization

A TOTAL of $400,000,000 should be spent on highway construction in Montana during the next ten years, according to C. E. Stahl, Montana State Highway Engineer. He outlined a construction program before a special legislative committee, made up of 80 appointed "grass roots" representatives, that would bring Montana's primary and secondary systems now mapped to modern standards at the end of the ten years. And he warned that if the program could not be consummated, maintenance costs would eventually mount to the point where little of the state's revenues would be left for new construction.

The special highway interim committee, with George Schotte of Butte as its chairman, was instructed by Montana's Governor Bonner to determine by mid-1950 a concrete legislative program for financing the necessary road construction. The current tax program of the state indicated that only slightly more than $100,000,000 could be spent for the purpose during the 10-year period.

According to the report by Stahl Montana has 12,600 mi. of highways in its system—1,250 mi. as part of the national interstate system, 4,530 mi. on the primary system and 6,820 mi. in the secondary system. Approximately half of the roads eligible for federal aid have had work done on them. During the next ten years, 5,790 mi. of the primary system will require reconstruction, and 5,740 mi. of the secondary system will have to be brought up to standard.

# County Shops Designed for Efficiency

***Every consideration has been given to the prime functions of repair and maintenance in the design of new shops for Lane County, Ore. — Spaciousness and effective layout of machinery are outstanding features***

By
CLAIRE R. PARKS
Master Mechanic
Lane County, Ore.

ONLY ONCE in a great while is a county able to start from scratch and build a repair and maintenance shop that is custom-tailored to suit all its needs. Lane County, Oregon, was able to do this; and from the sumps, truck hoist, and radiant heating pipes at the bottom, to the three craneways, inset fluorescent lamps, and vertical skylights at the top, its new building has been designed with insight. The complete structure and its appurtenant buildings on the 11-ac. site are the result of integrated thinking on the parts of the county commissioners, master mechanic, consulting architect, and county engineer.

In the form and layout of the shop, every consideration has been given to its prime functions—repair and maintenance. The main room of the shop is 84 by 90 ft., and a 15- by 47-ft. chamber at the side isolates torch- and arc-welding and the forge furnace and its accessories.

### Ample room and lighting

Outstanding features of the main room are its spaciousness and the large clearance between columns. Each bay has a clear distance of 16 ft., 10 in., so that heavy trucks and flat-bed trailers can be spotted without difficulty into any available part of the room.

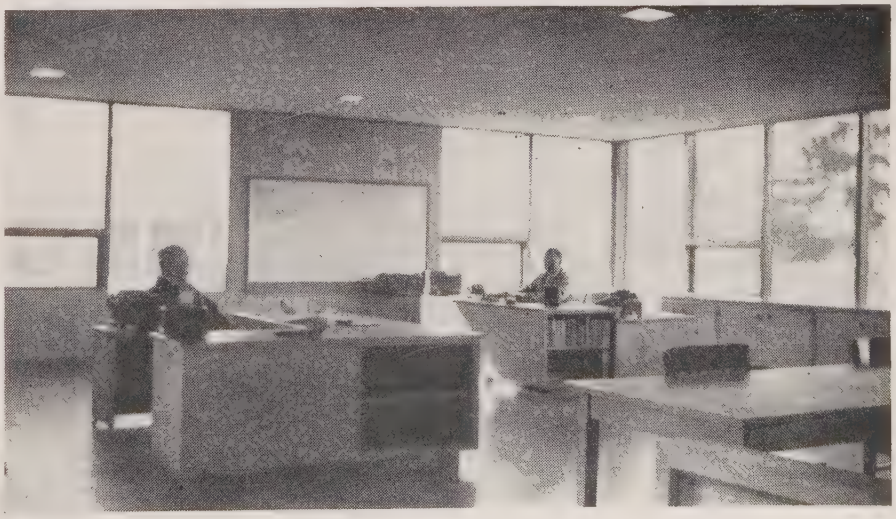
Once the equipment is inside, the repair crews find that there is ample lighting available for their work. On the three exposed walls of the main room, over 70% of the total area consists of glass windows, with each glass panel 4 ft. square. In addition, many more 4-ft. glass panels are arranged in three vertical skylights on the sawtooth roof.

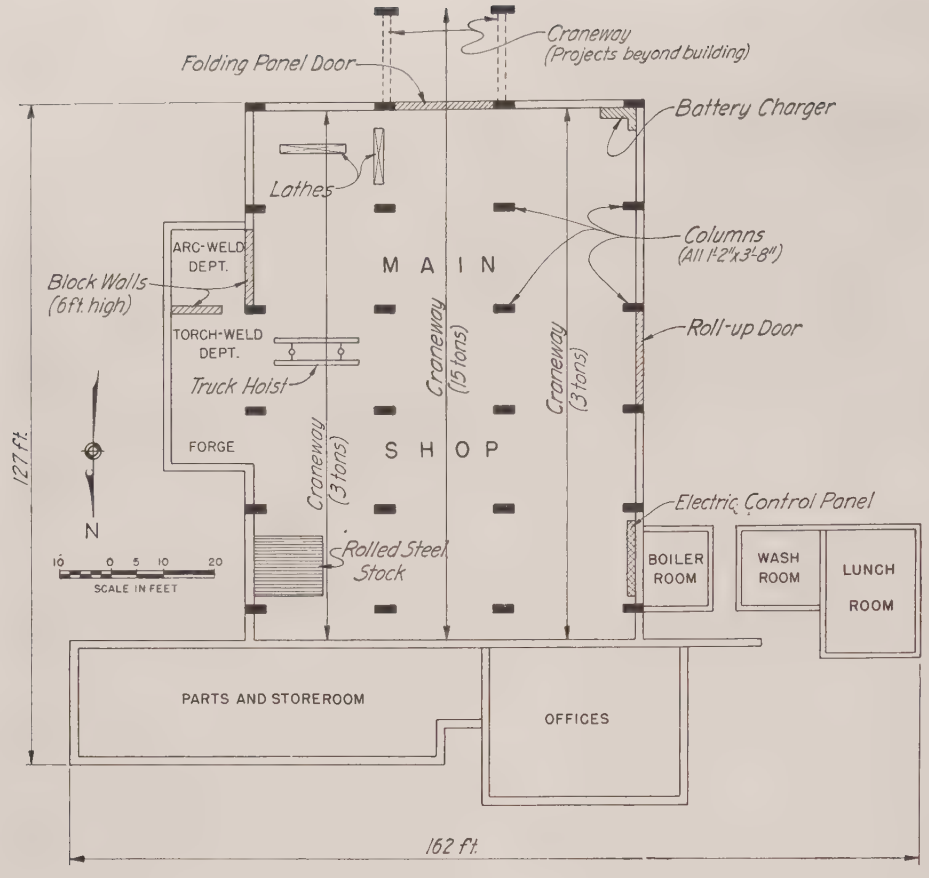
General artificial lighting is provided by 8 fluorescent tubes in each bay. The tubes, and their ballasts and reflectors, are recessed into each overhead beam. Shop buildings and grounds are located on a large site near the north edge of Eugene. They are immediately adjacent to railroad spurs and just a few blocks away from U. S. Highway 99, a highly desirable location for fast delivery of supplies and especially for handling of road oils. When the old county shop had to be disbanded to make way for a new highway, the county acted to replace its former barn with a permanent reinforced concrete and pumice block structure. Lane County, on top of all United States counties in lumber production last year, has roads that take heavier poundings than is usual, which automatically means more road maintenance and equipment repairs.

The floor slab of the main shop room is slightly depressed toward two sumps, one at each end, so that sections of the deck can be hosed down with little effort. There is gravity flow from the inclined floor to sewers.

Every piece of equipment that the county owns or contemplates buying in the future can enter the shops with ample clearance. On the west side of the

**EFFICIENCY of operations and comfort for personnel were considered in design of the shop's offices. Increased cost for the modern facilities was judged to be a sound investment.**






**FLOOR PLAN of the shops required considerable attention to make sure that adequate space would be provided for servicing the county's many different types and sizes of equipment.**

building, an electrically-operated roll-up door takes up a full 16 ft. of the bay, and has an unimpaired vertical clearance of 18 ft. On the south side, a wooden panel door folds away to give a clearance 22 ft. wide and 18 ft. high. The center craneway projects beyond the building 16 ft., and as the crane approaches the south door, it pushes a vertical sliding panel ahead of it to the end of the tracks. This sliding panel rests upon a wheel-truck on the crane tracks, and gives a total vertical clearance of 24 ft.

Throughout the main shop, wash room, lunch room, and offices, heat is supplied from a radiant heating system embedded in the concrete floor slabs. In the main shop, ¾-in. round copper tubing is laid on 18-in. centers throughout. For the other rooms, there are five ½-in. circuits. The radiant heating system is the sole load imposed upon the boiler, located between the wash room and the main shop. The boiler burns inexpensive crude oil. A butane tank is located just outside the boiler room, and supplies fuel for firing up the boiler to temperature. No heating is supplied to the spare parts room of the shops, since very few man-hours are spent there and the heating effort would be ineffective.

Every inside column in the shop is equipped with four 110-v. outlet plugs, and there are numerous additional outlets along the walls. The 220-v. outlet taps are located only at the junction boxes. There are five permanent compressed air outlets in the shop, and an underground conduit serves three outlets in the outside service station.

At the old Lane County shop, men and machines were cramped into close, dark quarters, so it surprised the shop foreman how well organization was simplified in the new and adequate space. Torch- and arc-welding are isolated from the rest of the shop, for the most part. Where welding on the equipment is necessary, leads from the motor-generator set are coiled on drums and can reach any spot in the shop. A portable acetylene generator and two oxygen cylinders on a wagon can be wheeled anywhere in the room.

### EQUIPMENT SERVICED AT LANE COUNTY SHOPS

14 motor graders
2 crawler shovels
2 10-ton rollers
1 2-ton roller
3 brush mowers
1 sweeper-mower
2 truck-mounted compressors
6 portable compressors
5 Diesel power units for rock crushers
7 rock crushers
7 draglines on runners, for rock crusher feed
1 3-tankcar capacity boiler and booster for road oil
2 portable conveyor loaders
41 3 to 5-cu. yd. dump trucks
11 flatbed trucks
1 truck and flatbed trailer
32 pickup trucks
17 sedans
6 coupes
4 bulldozers
1 snowplow
2 tractors
2 oil distributors complete on trucks
3 "patcher" units, with dump truck and trailer unit

### Craneways save man-power

Three craneways run the entire length of the shop to serve every square foot of space within the walls. Two 3-ton Chisholm-Moore hoists run on the outboard, and between them a 15-ton P&H travels the length of the 5 bays and continues the length of an additional bay outside. There are no dollies resting around the shop, and the crane system helps to make full use of the large floor area. Cranes save time in other ways, as well. For instance, when inserting the master pin in the bed of a dump truck, the bed in many cases doesn't set squarely. A crane not only lifts the bed but can be used to apply a slight torque to line up the holes. One man and the crane can do what 3 men did formerly on setting master pins, and still save two hours on the job. Specially shaped slings are made as needed, and kept "on file" in the shop.

Arranged around the side of the shop are the usual items of machinery and tools found in county shops. There is a hydraulic press, for transmission and final drive work, an electric brake riveting machine, and a 110-v. transformer and rectifier with low, extra-heavy battery shelves for battery recharging. Tool cabinets with sectioned, sliding drawers line one corner of the shops, and serve the two lathes secured nearby. Other equipment placed as needed are a 120 cfm. air compressor, a threading machine, a drill press, carborundum grinders, and a homemade belt grinder.

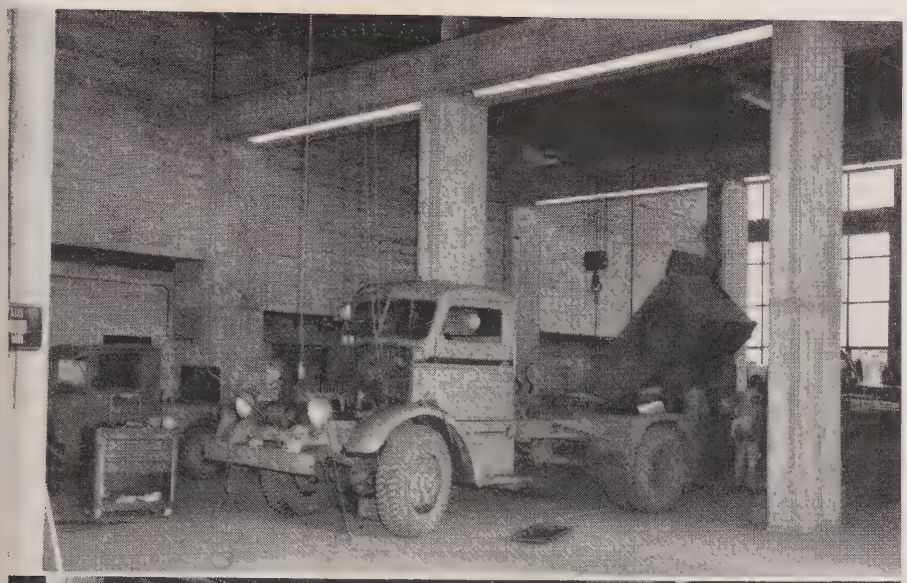
Located directly in line with the roll-up door, but on the other side of the shop, is a 5-ton, 2-piston truck lift. Although there is plenty of room to maneuver trucks inside the main shop, it isn't necessary in order to do fast work or inspection on the lift.

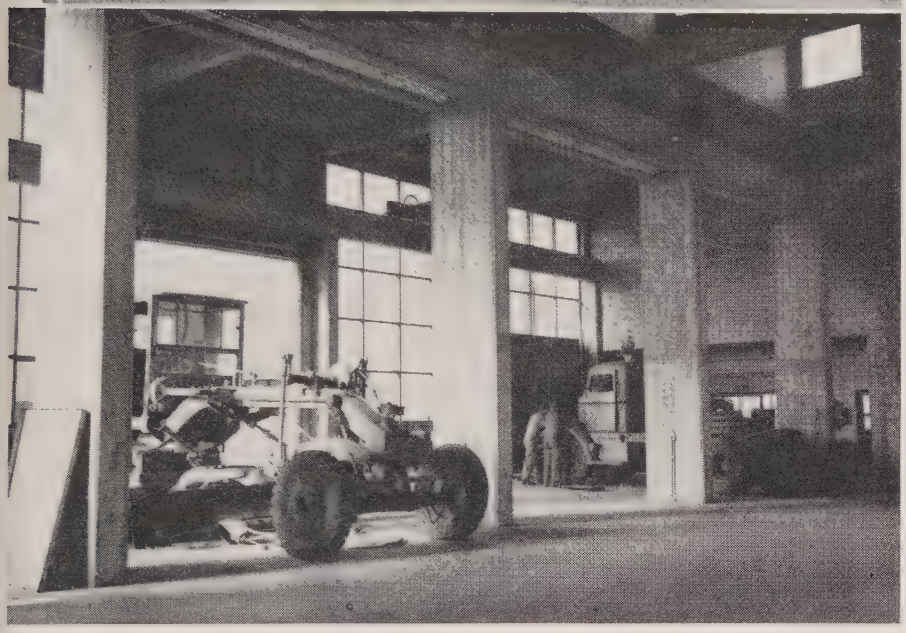
Lane County has always furnished tools to their mechanics, and replaced broken or worn out tools. With eight mechanics working in the new shops, each has his own tool cabinet unit. Tool losses and breakage are down to half of what they were previously. This is perhaps helped by the fact that each mechanic retains the key to his own cabinet and therefore the responsibility of keeping a full set of tools in good order.

All rolled steel stock is kept in one corner of the shop, and each size has its own shelf. The large, heavy plates are put on edge and kept together in vertical racks. These racks, as well as many other shelves in the shop, were built by the county crews during the time the machinery was dismantled and moved.

Each day, there are 88 man-hours of work done for repair and maintenance of equipment, exclusive of two bookkeepers and a handyman. Although most of the work is done on the day shift, two mechanics and a tire man work at night.

This year the Lane County road





FLOURESCENT LIGHTING fixtures, visible in top view, are recessed in the beams and extended for the length of the main shop room. Bottom, a big grader disassembled in the bay adjacent to the roll-up door still leaves plenty of room for moving other heavy equipment.

budget is close to $1,200,000, and although this is a large sum, an attempt is made to spend the greatest possible amount of this money on the roads themselves. In keeping with this policy, just the barest of essentials in the spare parts line are stocked at the shops. This sometimes means that a piece of equipment is held up in the shops awaiting repairs a little longer than otherwise necessary, but this system doesn't hamper efficiency due to the constant backlog of scheduled repair work. As county men throughout the West know, "There is always something to be done."

P. M. MORSE, Lane County Engineer. The new shops will ease his job of directing engineering of the county's road system, which is heavily pounded by lumber trucks.

The recently completed Lane County shops were built under a $91,227 contract to Waldo S. Hardie & Son, Eugene contractor, and J. L. Reynolds was the consulting architect. Included in the contract are a two-pump gas station and garage, and two long storage sheds, arranged in lengths of 24 and 26 carports and opening on the grounds surrounding the shop buildings.

In addition to the main shop room, there is a lunch room, shower room, lavatory, spare parts room, and general office, all designed in keeping with the fact that repair and maintenance productivity go hand-in-hand with floor space, light, comfort, and off-duty facilities.

Operations at the shop are under the direction of Road Commissioners Walter J. Holland and Lee G. Raish. Fred Smigley is Roadmaster and the writer is Master Mechanic. Lane County Engineer is P. M. Morse.

## Wyoming Answers Critics Of City Bypass Highways

AN EXPLICIT and forceful policy on the routing of major highways away from city business districts was delineated by the Wyoming State Highway Commission after businessmen of Douglas, Wheatland and other Wyoming communities protested that such re-routing would cut into their income from tourist travel. Because the problem of highway routing, already a perennial one, is becoming more important in view of the Western states' extensive program of super-highway construction, excerpts from the policy statement follow:

"There have been many instances in the past in which various groups have discouraged the construction of new or additional routes between communities in the honest belief that additional highways would be harmful to the business economy of that particular community. The Commission is of the opinion that tourists cannot be forced to spend more money in Wyoming by creating road blocks or other hazards intentionally or unintentionally designed for that purpose.

"One important feature to the people of Wyoming, from the standpoint of protecting their investment in highways, is a determination as to whether the use of that highway in any given community will be destroyed by encouraging traffic, either moving or parking, so that such investment is lost through elimination of its use for highway travel. That objective cannot be safeguarded through the highway approach law which operates to discourage new businesses upon new routes through or marginal within any community. If such highway investment is protected in this fashion, the investment of private individuals in business on existing routes is protected in that new competing businesses cannot spring up along any new or changed route.

"The Commission is aware of the fact that each community has a different problem and that the determination of routes in respect to each community should be governed not only from the desires of all the people from that community but from the standpoint of sound engineering, good investment in the highways and in the future of Wyoming and based upon facts to be determined prior to the location of any route as to the estimated benefit or detriment of any changed routing might have with respect to any community.

"It has been, and will continue to be, the policy of the Highway Commission to give consideration to all factors referred to above in routing, re-routing or maintaining in their present locations the highways of Wyoming in, through or adjacent to Wyoming communities, that such routing shall give consideration to the needs and desires of the highway users, the residents as well as the interests of the investors in and about any community and the economic effects upon each community."

## *Last Section of Salt Lake Aqueduct Requires—*

# Difficult Pipeline Work in Canyon

***Excessive water in trenches complicates placing last and most difficult section of Salt Lake Aqueduct—Water will soon reach Salt Lake City through the 69-in. pipeline***

RAPIDLY nearing completion is the last 5½ mi. section of the Salt Lake Aqueduct, planned by the Bureau of Reclamation and the Metropolitan Water District of Salt Lake City to prevent any future water shortages in the Utah metropolis similar to those which occurred there in some of the dry years of the early 1930's.

The aqueduct is actually only one segment of a double-barreled project utilizing the water of Deer Creek Reservoir on the Provo River. The 235-ft. high earthfill dam will furnish 150 ac. ft. per sec. to the Salt Lake Aqueduct for municipal purposes and 550 cu. ft. per sec. to the Provo Reservoir Canal for irrigation of farm land east, west and north of Utah Lake.

### Last is most difficult

The total length of the Salt Lake Aqueduct from the outlet works at Deer Creek Dam to Sam Park Reservoir, the existing terminal reservoir which is to be enlarged to take care of the additional supply, is 41.68 miles. About 4½ mi. is in tunnel, the balance is steel on concrete conduit, 69 in. in diameter. The last and most difficult section of the aqueduct is the 5½-mi. length immediately below the outlet of the dam, which includes three tunnels and a lot of difficult pipeline work in the bed of Provo Canyon. When the section is completed early next spring, water delivery will be possible, although no contract has yet been awarded for the enlarged Sam Park Reservoir.

The final segment is being constructed by United Concrete Pipe Corp. of Baldwin Park, Calif., under two separate contracts. The contract for pipeline, intake and other structures was in the amount of $2,429,201. That for construction of the three short tunnels amounted to $439,330. Roy Chinnici is general superintendent for both contracts.

To permit work on the intake structure, which is located close to the normal outlet works of Deer Creek Dam, the outlet was completely closed, and since early in June, when the reservoir was filled, water for downstream riparian rights has been discharged over the spillway and diverted around the operations in a temporary dug channel. Groundwater was pumped out of the excavation into the diversion channel. All underground construction for the outlet works has now been completed and backfilled by tractor and flooding.

The intake structure is a reinforced rectangular concrete box 8 ft. high and 5 ft. 9 in. wide with 12-in walls. The intake opening slopes back on a 1½:1 angle and is covered with fine steel grating to serve not only as a trash rack but also as a fish screen. Immediately behind the intake is a gatehouse with an electrically-operated slide gate, and a few feet further on is a vent house and a transition section from the rectangular box to the standard 69-in. round section of which the entire line is composed.

The next structure is a Venturi meter and chlorinating house, from which the aqueduct proper starts. Pollution sources above Deer Creek Reservoir are not numerous, and after ponding in the reservoir, the quality of water passing into the aqueduct is found to be remarkably good, but the chlorinating facilities are being constructed concurrently with others in order to be ready for use when needed. Excavation for the aqueduct line is carried out by standard methods, with blasting required around some projecting noses of rock. In riverbed sections, the trench made excessive water and in these cases the trench was widened and deepened along one side to act as a drain sump, and from this trench the water was removed by pumping.

Crossings of the channel were not deep enough to require special siphons, and were accomplished by re-channeling the limited flow of the stream while one-half of the crossing was excavated and the pipe laid, and then swinging the

PICTURED ABOVE—

THROUGH SLOUGH areas, the trench is widened and deepened along one side to act as a drain sump. Seepage water is then pumped out—pumps along trench at right.

stream back over the completed section to permit construction of the second portion.

In a few areas of particularly marshy land, where the bottom of the trench remained soft and spongy even after drainage, a blanket of crushed gravel was spread before placing the pipe. Backfill is selected friable material carefully compacted under and around the pipe.

### Beveled lips for sharp curves

The 69-in. pipe, with 7½-in. walls is being cast by United Concrete Pipe Corp. at its plant in Pleasant Grove, Utah, (*Western Construction News*, Feb. 15, 1949, p. 63), and hauled to the trench-side by truck and trailer. Small angles in the line can be taken up by standard joints in the pipe, but for the sharper curves, beveled lips are pre-cast into the pipe. After a rubber sealing gasket is forced into a groove cast into the spigot end of each 20-ft. length of pipe, the section is lifted into the trench by a crane and the spigot carefully guided into the bell of the preceding pipe. It is forced tightly into place by a come-along anchored by a shoe a couple of lengths back in the already-placed pipe and hand-operated winch. It continues to be supported by the crane until enough backfill and bracing is placed to secure it in position.

A joint crew follows closely behind the laying operation, and outside grouting of the joints is completed ahead of the backfilling. Inside caulking and grouting will not be carried out until backfilling is completed and a low uniform temperature is secured throughout the full length of the line.

The three tunnels in the canyon section of the aqueduct are respectively 490, 950 and 2,550 ft. in length, and are constructed on the hydraulic grade line of the flow, so that the tunnel is under no pressure whatever. Since most of the pipeline is 20 to 30 ft. below the hydraulic gradient, the pipeline pitches sharply into and away from an open-topped vent structure immediately outside of each portal.

STEEL H-beam supports were used in the horseshoe-shaped tunnels, and were left in place when the concrete lining was poured.

OUTLET WORKS and stilling basin at Deer Creek Dam are shown in foreground, with arrow pointing to the intake structure where the Salt Lake Aqueduct diverts from the stilling basin. Remainder of the water from the outlet goes into the Provo Reservoir Canal for irrigation.

The tunnels are horseshoe shaped, with an arch radius of 3 ft. 3 in. Excavation was not particularly difficult, standard rock methods being employed. Steel H-beam supports were used and left in place when the concrete lining was poured. This last operation was carried out with collapsible steel inside forms running on concrete curbs poured first. The minimum thickness of lining was 3 in., unreinforced.

### Two Pumpcretes line tunnel

Concrete for all structures on the job was batched at a central plant located approximately at the center of the job, and hauled to the point of placement in transit-mix trucks. The tunnel lining was placed by Pumpcrete machines. For the center portion of the longest tunnel, two Pumpcretes in tandem were used. The mixer truck discharged into the hopper of the first, outside the portal, which pumped it to the hopper of the second, near to the point of placement. The second machine in turn conveyed the concrete to the top of the arch where it was discharged back of the forms. Forms were stripped in 7 or 8 hrs., and a white-pigmented curing compound was then sprayed on the concrete surface. Usually 100 ft. of lining was poured at a time, this requiring five sections of form. The final concrete operation was the pouring and finishing of the tunnel invert, using wooden floats.

Contracts for steel siphons on two sections of the aqueduct across Cottonwood and Little Cottonwood Canyons, and other pipe sections on the aqueduct, are completed, or will be within the next few weeks, so that with completion of this 5½-mi. section, water may be delivered to Salt Lake City.

The work of the aqueduct, as well as the Provo Reservoir Canal portion of the Provo River project, is under the direction of E. O. Larson, regional director of the Bureau of Reclamation at Salt Lake City. L. R. Dunkley is project engineer for the Bureau, and he is assisted by C. G. Bargeron, resident engineer, W. F. Gentry, field engineer, and H. A. McKellar, office engineer.

Assisting Chinnici for the contractor, United Concrete Pipe Corp., is Ed Newberry, tunnel foreman, and Bob Scamness, pipe-laying foreman.

## Testing for Groundwater at Idaho Atomic Energy Plant

A CONTRACT for the first group of a series of ground water test holes in the central Snake River Plain, Idaho, has been awarded by the Geological Survey. This is part of the overall program of the Idaho Operations office of the Atomic Energy Commission to gather fundamental engineering information concerning its Reactor Testing Station near Arco, Idaho. That portion of the overall program pertaining to hydrology and geology has been assigned to the Geological Survey by the AEC.

The drilling contract has been awarded to the Cope Drilling and Pump Co., Terreton, Idaho, for an estimated total footage of 5,500 ft. at a maximum cost of $27,750. The group of test holes to be drilled under the contract will be located on Government lands in the area between Mud Lake and the Craters of the Moon National Monument. The test-hole drilling is for the general purpose of obtaining additional information on the underground geologic formations, the geologic structure, and the water bearing properties of rock formations that underlie the Plain.

# New Design for Welded Steel Tanks Saves Material, Costs

***The "Icosasphere," a spherical tank made up entirely of five parallelogrammic units, reduces both scrap losses and the total length of welded seams required for erection***

THE DESIGN of welded steel tanks for economy is governed by two important considerations. The shape and arrangement of plates to form the tank's shell should be such that a minimum amount of scrap loss is realized in cutting the plates from sheet steel, and the plate arrangement should result in a minimum total length of welded seam required for erection. A new design for welded steel tanks, called the "Icosasphere," promises savings in view of both considerations.

Design and erection problems inherent in the conventional "orange-peel" tank emphasize the two important features of the Icosasphere. The orange-peel design usually consists of a top and bottom saucer with one or more courses of approximately vertical plates in between. Since the plates are tapered, two can be cut from one rectangular sheet with a small amount of scrap. When this is done, the finished sphere plates are much narrower than that economical width which could result in a minimum footage of welded seams and which could have been obtained if only one sphere plate were to be cut from each rectangular steel sheet. However, if plates of the maximum width are cut singly to form the separate plates, the amount of scrap is excessive.

The Icosasphere, developed under the direction of J. O. Jackson, vice-president in charge of engineering and research for the Pittsburgh-Des Moines Steel Co., is a spherical shell formed by five parallelogrammic units. Its design (and its name) were derived from the geometrical properties of the icosahedron, the regular polyhedron with twenty identical triangular faces. It has long been recognized that four adjacent faces of an icosahedron may be flattened to form a parallelogram, but the important application of this fact to the design of welded spherical tank provided the key to economy. It suggested that a spherical shell could be formed by five parallelogrammic units, each of which represented four adjacent triangular faces of the icosahedron extended to the spherical surface.

The Icosasphere is then a sphere laid out along the expanded faces of an icosahedron. Five plates cut to the proper shape and dished form the complete sphere. These plates may each be cut from one rectangular steel sheet with a remarkably small scrap loss. As the size of the sphere increases, it is necessary to subdivide the five parallelogrammic units, and designs have been prepared based on subdividing each unit into two, three, four or eight parts.

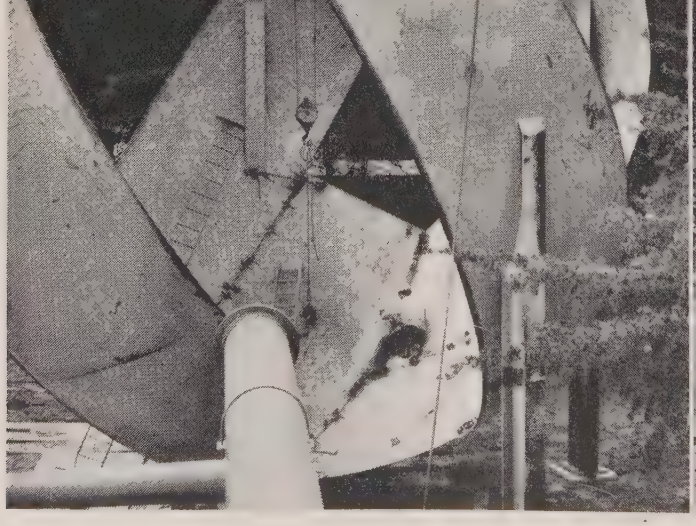
To illustrate the application of this design method to commercial spherical tanks and the resulting economies, a working model of the Icosasphere (illustrated) was erected and compared to an orange-peel tank of the same capacity. Both spheres had an inside diameter of 28.75 ft., were formed of 1⅝-in. steel plate, and were designed for a pressure of 205 p.s.i.

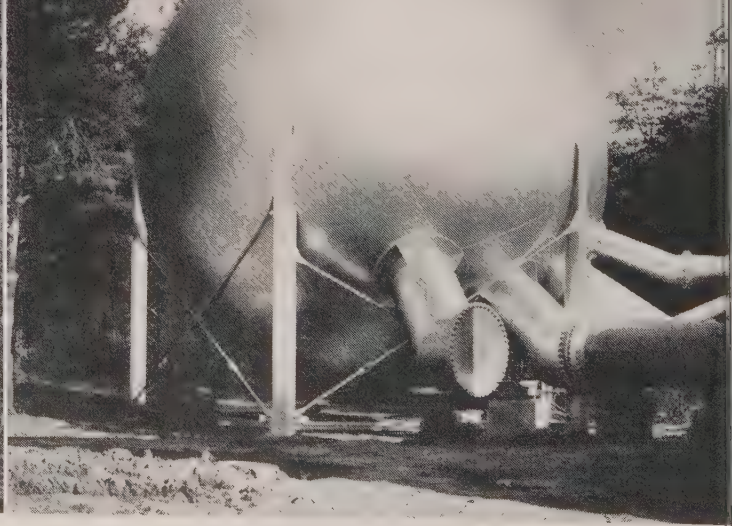
Total plate area consumed for the orange-peel tank was 3,670 sq. ft., while the Icosasphere required 2,970 sq. ft. (representing a comparative saving of 19% of steel by weight). Total length of welded seam required for the orange-peel tank was 590 ft., and for the Icosasphere, 468 ft. Estimated costs, including profit of 15%, were $18,825 for the orange-peel tank and $16,300 for the Icosasphere.

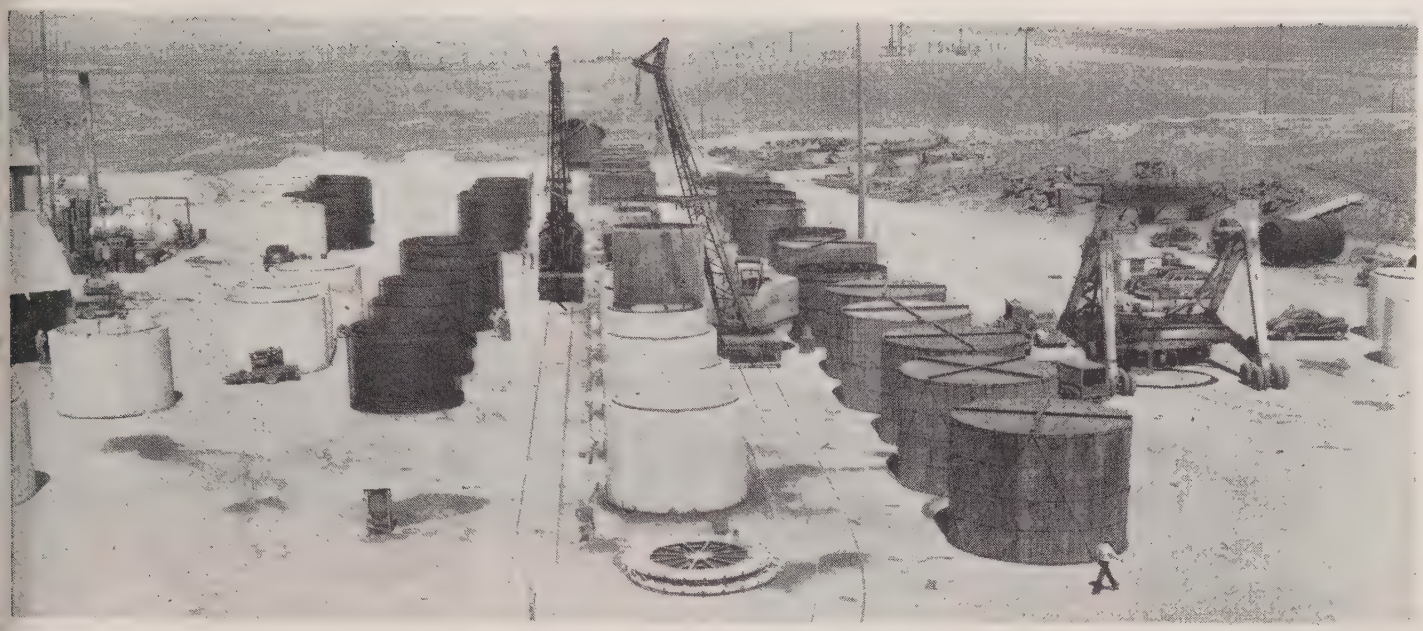
According to the research report released by Pittsburgh-Des Moines the type of welded joint used is not an essential part of the new design method. However, the type of weld was recognized as very important to the economical construction of either type sphere. As stated in the report: "If the seams are riveted, they must be of high joint efficiency or the shell plate thickness will be increased making the design uneconomical. If high efficiency riveted butt straps are used inside and outside, the weight of the butt straps and rivet heads is a large part of the total weight of required steel. It is more economical to butt weld the seams than to rivet them; and leakage, or seepage, which is difficult to prevent in riveted joints is avoided in properly welded ones."

For both of the experimental tanks previously discussed, butt welds were used. The plates were prepared by flame cutting a single bevel with a shoulder on each edge. The plates were tacked together leaving a space of 1/16 in. between the shoulders. The first continuous welds were placed on the beveled side in the bottom of the V-groove. After several beads had been welded, the joint was burn-gouged on the back side, removing the shoulders and the imperfect part of the first beads. The back side was welded next, and then the front side was completed. The report points out that savings resulted from this method as compared to use of double U-grooved joints.

Details in the foregoing report are from Research Report No. 7815-1, released recently by the Research Department, Pittsburgh-Des Moines Steel Co., Pittsburgh, Pa. Design of the Icosasphere is covered by patent applications.







## *Central Valley Pipeline Makes Use of—*

# Largest Concrete Pipe Ever Pre-cast

***United Concrete Pipe Co. establishes casting yard near Tracy Pumping Plant for building 65-ton sections of pipe — Unprecedented size requires new methods in forming, pouring, handling and placing the 15-ft. diameter sections***

THE LARGEST concrete pipe ever pre-cast is being built by United Concrete Pipe Co., at Tracy, Calif., for installation in the 200-ft. pump lift line feeding Central Valley Project water to the Delta-Mendota Canal. United is a participating firm in the group known as S. U. H. B., which holds the contracts from the Bureau of Reclamation for construction of the pumping plant, pump line, and portions of the canal. The whole group consists of Stolte, Inc., Oakland, Calif.; United Concrete Pipe Co., Baldwin Park, Calif.; Duncanson-Harrelson, San Francisco; and Ralph A. Bell, Monrovia, Calif.

The Delta-Mendota Canal unit of the Central Valley Project is the canal which flows southerly from the delta of the Sacramento and San Joaquin Rivers along the west side of the San Joaquin Valley to the vicinity of Mendota, about 35 mi. due west of Fresno. At the head of the canal, it is designed to handle 4,600 cu. ft. per sec. Inasmuch as the San Joaquin Valley slopes from the south to the north, it is necessary to raise the water from the delta to a point from which it will flow by gravity to its southerly terminus.

### Water lifted 200 ft.

Accordingly an intake structure still to be built will be located on the shore of Old River, one of the winding branches of the San Joaquin in the delta. At the termination of the intake canal, about 13,300 ft. from the intake, is the pumping plant consisting of six 767-cu. ft. per sec. pumps, operating against a head of 197 ft., and each powered by a 22,500-hp. electric motor. These discharge into 120-in. steel pipes, which converge by pairs 166 ft. out from the centerline of the pumps into three pipes each 15 ft. in diameter, to carry the water to the start of the canal proper.

The bid advertisement for the pipe contract contained two alternate types of pipe for this section, namely precast concrete and steel-lined monolithic concrete. The SUHB firm bid on both types, but was about $145,000 lower on the precast type, with a bid of $2,552,302.

To cast the huge pipe sections, 15 ft. in diameter, 12 ft. long, with 15-in. walls, containing 28 cu. yd. of concrete, and weighing 65 tons each when completed, the contractor has set up a special yard near the pump plant, and constructed a monster traveling A-frame to move the completed sections from the yard to their position in the pipe line.

The steel cylinder and reinforcing steel cages are fabricated at the Stockton, Calif., plant of United Concrete Pipe Co., and transported to the casting yard by railroad flat car. By design, the ¼-in. steel shell is 2 in. from the finished inside surface of the concrete. Spirally-wound cages of plain round 1-in. reinforcing steel, believed to be the largest steel ever wound, are placed 2 in. inside the exterior wall of the pipe, and the two, cylinder and cage, are held securely in relative position by fins welded between the two. Steel bells and spigots, both pre-stressed, are welded to the ends of the steel cylinder, and are each very carefully fabricated to allow only a ¼-in. clearance between the two when placed in the field. After the cylinders are fabricated at the Stockton plant they are hydrostatically tested with a pressure of 20,000 p.s.i. before being sent to the casting yard. Likewise all welds in the wound cage steel are tested before acceptance.

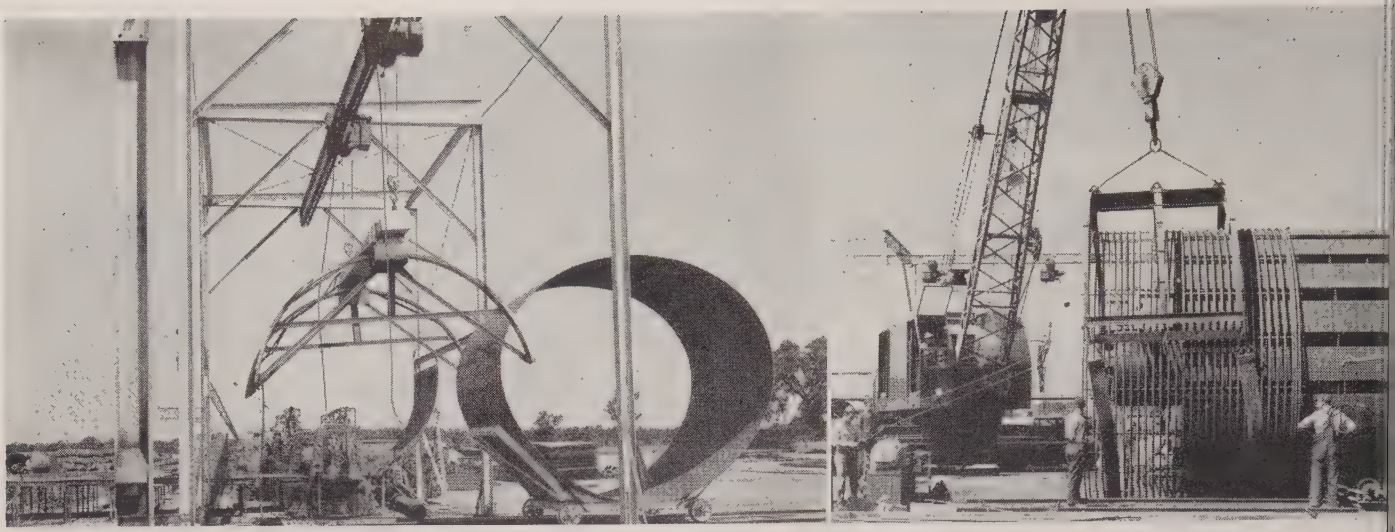
PICTURED ABOVE—

**CASTING YARD established at Tracy, showing all phases of the operation. At extreme left is boiler plant to furnish steam for wooden curing jackets, right; left center, pre-fabricated reinforcing cages; center, inside form being lifted from completed section; foreground, steel form caps; extreme right, the special hauling A-frame.**

### Huge machining job

At the casting yard, the pre-fabricated cages are set on carefully machined base rings. It was impossible to purchase castings of the size required, so United built and machined its own rings. They are 18 ft. in diameter, with eyes for lifting and for securing both the reinforcing cage and the sheet steel forms. The machining was done at the home plant in Baldwin Park, and it was necessary to use specially designed flat cars with depressed platforms for transporting the rings to Tracy. Similarly machined cap rings were also built up by United and transported to Tracy to secure the upper ends of cage and form.

A set of 18 base rings was made. Only six sets of sheet steel forms were built. Both inside and outside forms are collapsible. The outside forms have a circumferential spread of about 6 in., which



STEEL CORE for the pipe is pre-fabricated at United's big Stockton, Calif., plant. Above left, the ¼-in. steel plate is rolled welded by the Unionmelt process. At right, the 1-in. rod, largest ever wound, is taken from the winding barrel to be welded to the circular steel shell. After affixing the bell spigot, steel sections are hydrostatically tested.

CONCRETE is batched and mixed in a standard plant, then discharged onto a conveyor belt, which fills concrete buckets, transported by railroad crane to the forms. At left may be seen several of the steel cages as they are delivered after testing at Stockton plant.

can be drawn together with bolts a held closed by a system of latches a steel wedges. The interior forms a have a throw of about 6 in., and a equipped with a flap to cover the op ing left when they are expanded i position. Brackets to hold 8 pneuma vibrators are welded onto the outs form.

### Batching five kinds at once

Concrete for all work, including t pump house, pipe, retaining wa grouting, and all other purposes, batched and mixed in a central plant, conveniently organized and operated Roy Edwards, chief operator, that many as five different specifications concrete can be produced for differ purposes at the same time.

The plant consists of a Noble batch supplemented by a separate Kron sc for cement. Aggregates and cement delivered to hoppers by truck, a moved to bins above the batcher by in. conveyor belt for the aggregate a bucket elevator for the cement. Bene the batcher are two 56-S CMC mixe which discharge through chutes eit into agitator trucks or onto a conve belt, whichever is desired.

Concrete for the pipe casting is signed to have a 2-in. slump and strength of 4,000 lb. at 28 days. Vin resin air-entraining agent is added produce 3% air to improve workabil Five vibrators are mounted around lower half of the form, and operate a rate of 10,000 vibrations per minu while concrete is being poured into lower section. Three more vibrators mounted around the upper half of form and vibrate at the same rate wh that portion is being poured.

### Casting and curing

Concrete for the pipe sections is c charged from the mixers onto the c veyor belt and from that into 8-cu. concrete buckets (not filled to capac because of the limitations of the h dling equipment). These are picked by a crane mounted on a railroad tr and lifted above the sheet metal c placed over the forms. The "mud" is loaded by an operator riding on bucket, over the cone, and slides do

SPECIAL RIG for moving the 65-ton sections of pipe was devised by the contractors. It is a heavy A-frame powered by tank retriever, in pictures above, but sometimes by tractor, with hoists and clamps all operated pneumatically. Left, placing; right, carrying.

its surface in all directions. About 25 min. is required to fill the forms for one pipe section.

The forms are removed after about 6 hours, and a wooden steam jacket is lowered over the newly-cast pipe section. The concrete is steam-cured inside this jacket at a temperature of 120-150 deg. F. for a period of 36 hours, after which the jacket is removed and the pipe is saturated with water. A white membrane curing compound is then sprayed on.

After the pipe is cast and cured, it is placed in a storage yard. Each section of pipe is carefully numbered and designated for a specific point in the pipeline. A total of 731 sections is required for the three lines. Bends in the line, both vertical and horizontal, are taken care of by bevels on the spigot end, which in casting are always at the top end of the form. The maximum bevel has been 6¾ in.

### Special carrier rig

In laying the pipe, the sections are transferred from the storage yard to the bank of the trench by a special A-frame rig specially fabricated for the work and operated entirely by pneumatic action. During the summer months the power was supplied by a tank retriever truck, but with the coming of the rainy season, a crawler tractor was substituted. The rig itself is mounted on rubber tires. In its operation, a heavy steel band completely circles the pipe section near one end. Cables draw this band tight, and others start lifting. The pipe is lifted off the ground and carried in the upright position. At the trench-side it is rotated about the bottom edge, and deposited in the horizontal position. At the trench-side it is rotated about the bottom edge, and deposited in the horizontal position. After the conveyor rig is hauled away, the section is picked up by a Speedcrane and gently worked into position in the trench.

Joints are grouted on the outside by fastening a band of kraft paper completely around the joint, and pouring a creamy soft mix of grout into a hole at the top, so that it runs all the way around. Joints are caulked inside with a special lead and fiber gasket tapering in thickness from 1/16 in. to 5/16 in., and 1¾ in. wide, completely circling the joint. This is driven firmly into the narrow space between the bell and spigot of the two sections, and the joint finally made smooth with gunite.

### Organization

For the Bureau of Reclamation, Oscar G. Boden is construction engineer, J. R. Granger is resident engineer, Max R. Johnson is field engineer, and Russell Vinsonhaler is pipe line engineer. Byron Bullert is concrete inspector.

For SUHB, the contracting group, George Waters is project manager and Leo French is in charge of pipe casting and curing. Pipe laying is under the direction of Valado Merchop. At the Stockton plant of United Concrete Pipe Co., where steel for the pipe is fabricated, Harold Pope is project manager, and Robert Twitchell is in direct charge.

# Navy Engineer Discloses Plans for Slowing Terminal Island Subsidence

AN AREA of 12 sq. mi. bordering the Los Angeles-Long Beach harbor is sinking 2 in. every month, and since 1937 the subsidence "has reached the astonishing total of more than 9 ft.," Commander Lewis C. Coxe, Public Works Officer of the Long Beach Naval Shipyard, told the Waterways Division of the American Society of Civil Engineers early last month at Washington, D. C. Removal of oil and gas from the Wilmington Oil Field is blamed for the subsidence. Since discovery of the field in 1932, about 2,000 wells have been drilled into the oil zone, which lies at a depth of from 3,500 to 7,000 ft. These wells are operated by 130 separate companies or individual owners, who are removing 45 million barrels of oil annually and more than 64 million cu. ft. of natural gas daily from the field.

Engineers and geologists who have studied the phenomenon believe that the total subsidence will reach 18 to 23 ft. by 1963 unless methods can be found to retard or stop it.

Other oil fields have sunk following the removal of oil, so the sinkage of the Wilmington Field is not unique. However, "three factors distinguish subsidence at the Wilmington Field and set it apart from other areas," Commander Coxe stated. They are—the magnitude of the sinkage; the magnitude of the invested capital in the sinking area, estimated at $500 million; and the danger of destruction or serious damage to industries, harbor facilities and the Navy Shipyard by inundation by the sea at high tide. Already Holland-like earth dikes have been thrown up around the Ford Motor Company's assembly plant, Proctor and Gamble's plant and the Craig Shipyard; and special construction is protecting the Southern California Edison Company's steam plant from inundation and damage.

Engineers of the Bureau of Yards and Docks of the Navy have made a step-by-step plan to construct concrete walls along the harbor front of their $100-million shipyard, piers, quaywalls, and drydocks. These walls will be extended and raised progressively during the next five years as the land sinks. An appropriation for the first year's construction of $1½-million is available to start work in the near future. These temporary expedients have been taken so that engineers can find methods of slowing down or stopping the subsidence.

Two plans are under study. The first is to reduce the rate of removel so that groundwater will have time to percolate through the tarry deposits into the oil zone to take the place of the oil and gas recovered. The second plan is to pump water under high pressure into the oil zones through wells to replace the oil and gas removed. This "repressuring" method has improved oil production in in other fields.

## *Live Dynamite Discovered in Dam Face Complicates—*

# Repair of 40-Year Old Concrete Dam

***Grouting to eliminate seepage that caused dangerous ice formations on abutments and safe removal of live dynamite from dam face feature rehabilitation of Wyoming dam***

By

A. W. SIMONDS

Engineer

Bureau of Reclamation

Denver, Colo.

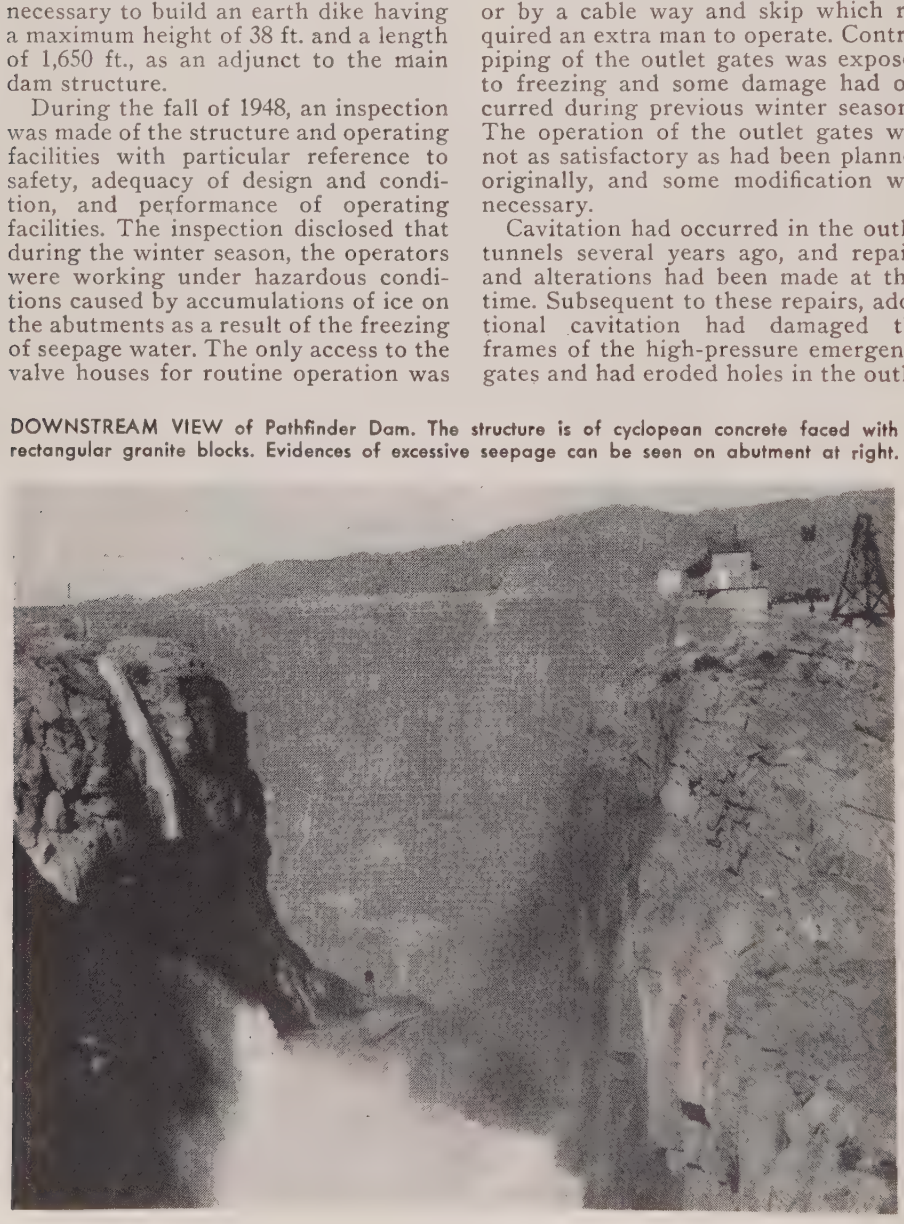
AS A PART of the general program for rehabilitation of the older structures of the Bureau of Reclamation, work is now in progress toward modernizing the 40-year old Pathfinder Dam of the North Platte Project in Wyoming. Removal of live dynamite which had been in the main dam for 40 years, and grouting of seepage which each winter had made spectacular but dangerous ice formations below the dam, feature the work.

The dam is situated in a narrow canyon of the North Platte River about 47 mi. southwest of Casper, Wyo., and is an arch structure curved to a radius of 150 ft. Its height is 214 ft., and it has a crest length of 432 ft., top thickness of 10 ft., and base thickness of 94 ft. Comprised of cyclopean concrete faced with rectangular granite blocks, its total volume is 65,700 cu. yd. Because of a low place in the reservoir rim, it was necessary to build an earth dike having a maximum height of 38 ft. and a length of 1,650 ft., as an adjunct to the main dam structure.

During the fall of 1948, an inspection was made of the structure and operating facilities with particular reference to safety, adequacy of design and condition, and performance of operating facilities. The inspection disclosed that during the winter season, the operators were working under hazardous conditions caused by accumulations of ice on the abutments as a result of the freezing of seepage water. The only access to the valve houses for routine operation was either by means of a long ladder which required considerable time to negotiate, or by a cable way and skip which required an extra man to operate. Control piping of the outlet gates was exposed to freezing and some damage had occurred during previous winter seasons. The operation of the outlet gates was not as satisfactory as had been planned originally, and some modification was necessary.

Cavitation had occurred in the outlet tunnels several years ago, and repairs and alterations had been made at that time. Subsequent to these repairs, additional cavitation had damaged the frames of the high-pressure emergency gates and had eroded holes in the outlet tunnels in both abutments. When wate releases were required, river gagin compelled the operator to walk ½ mi. t the gaging station to check the releas One of the towers of the cable wa had deteriorated until it was no longe safe.

DOWNSTREAM VIEW of Pathfinder Dam. The structure is of cyclopean concrete faced with rectangular granite blocks. Evidences of excessive seepage can be seen on abutment at right.



### Grouting eliminates ice hazard

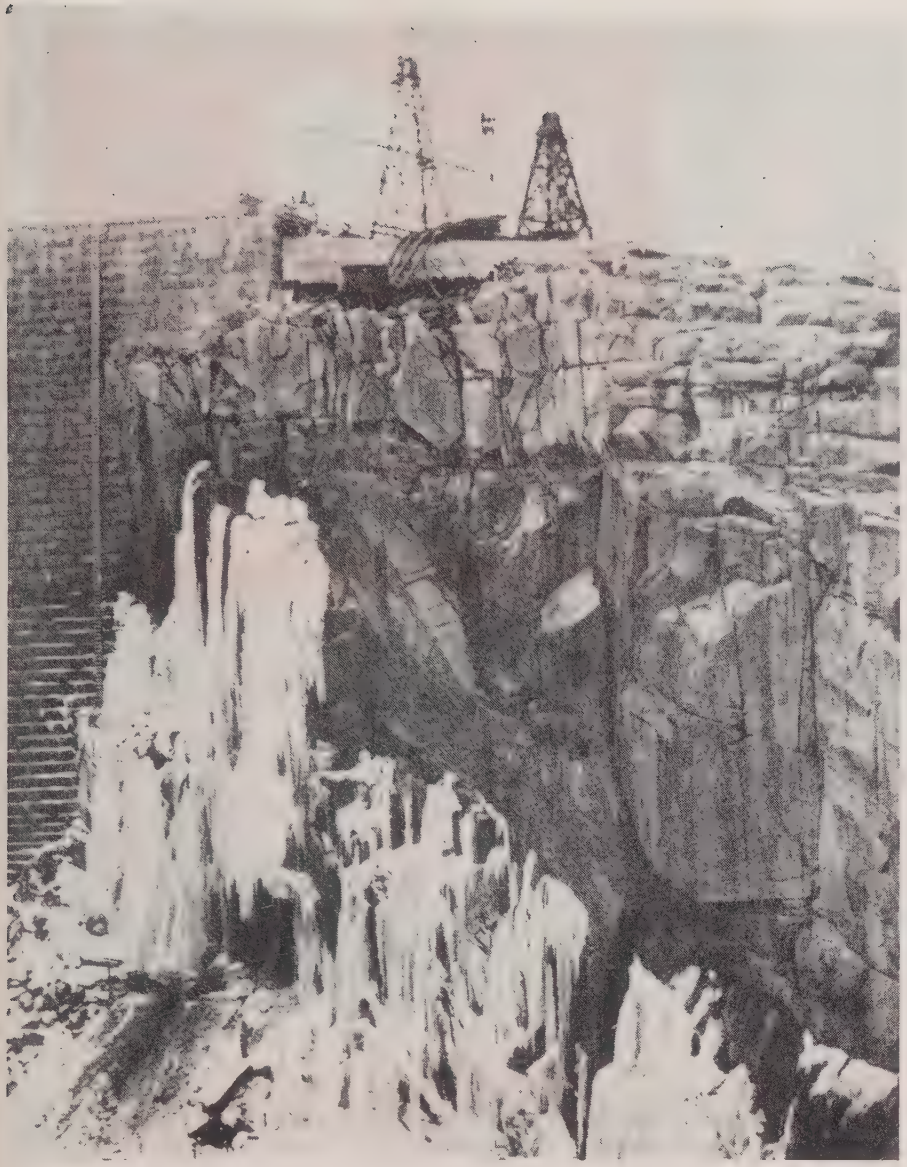
First item on the program of rehabil tation was to grout off the seepag water emerging from the abutments s as to eliminate the formation of ice du ing the winter season. Plans and specif cations were issued during the spring 1949 and a contract was awarded to th Continental Drilling Co., Los Angele This contract, completed recently, in volved the drilling of about 2,500 lin. f of grout holes, the furnishing of 1,5( bbl. of cement and the injection of abo 6,000 cu. ft. of cement grout into th abutments.

Grouting of the abutments was n necessitated by unsatisfactory stru tural conditions. It was necessary fo protecting operating personnel from u necessary risks. The rock forming th abutments is an excellent grade of ha granite with well defined cracks an seams through which small quantiti of seepage occurred. The seepage w sufficient to cause large accumulatio of ice during the winter season. Th daily removal of ice from walkways an ladders required working in expose places along the ice covered canyo walls where serious accidents cou occur.

The grouting program consisted forming a cut-off curtain in each abu ment. This was done by drilling hol from the rock surface along the u stream side of the dam. In addition t these, a curtain was also formed arou the vertical shaft to the emergency ga chamber in the left abutment. Th grouting required fairly deep holes, th maximum depth being about 175 Packer grouting was used in most case particularly in the lower sections of th deep holes. The grouting program su ceeded in eliminating seepage throug both abutments.

### Elevator on dam face

The second item of the rehabilitatio program is the construction of a tw passenger elevator on the downstrea face of the dam, providing access to th operating facilities. Kimball Brothe Co. of Council Bluffs, Iowa, w awarded the contract for furnishing an installing an electrically operated el vator with operating machinery, ma



ICE THAT FORMED on abutments was spectacular but dangerous to operating personnel. Accidents were a constant possibility on the ladders along the ice-covered canyon walls.

ually-operated car gate and landing gates, guide rails, all necessary control equipment and all other appurtenances and accessories. The guide rail supports and anchors, hoist house and machinery supporting beams, landing platforms, buffer supports, cable guard rollers, and supports will be furnished by the Bureau. Fabrication of the elevator is now under way and the installation will be completed during the spring of 1950.

### Dynamite discovered in the dam

During the planning of the elevator installation, drill holes loaded with dynamite were discovered in the downstream face of the dam. Old reports were studied and it was found that during the latter part of the construction period in 1909, a severe flood occurred endangering the Pathfinder dike, which was only partly built. It was not possible to complete the dike to a height sufficient to force the flood water over the dam's spillway. In order to save the dike, it was decided to drive a tunnel through the dam to provide the necessary relief channel. The 10 by 20-ft. tunnel would have required the excavation of about 210 cu. yd. of masonry, which could have been replaced at reasonable expense.

Hand drills started excavation of the tunnel in the dam, and use of a steam drill was planned after the first shot had made a shelf large enough to support a drill tripod. Luckily, after the first round of five holes in each face of the dam had been drilled and the holes in the downstream face were loaded for shooting, decreasing flow into the reservoir reduced the threat to the dike and made any shooting unnecessary. The loaded holes were then sealed with mortar, without removing the dynamite.

The condition of the 40-yr. old dynamite, which had been subject to freezing and thawing, was of grave concern to Bureau officials. In order to protect the personnel engaged in construction of the elevator facilities, it was decided to unload the holes. Several explosive firms were approached and the probable condition of the dynamite was discussed with them. It was decided to neutralize the dynamite with solvent. The mortar caps at the tops of the holes were removed, using oak wedges. The dynamite was neutralized and the primers were removed. After several applications of solvent, the residue was jetted safely from the holes.

Other items in the program of rehabilitation include the installation of an automatic reservoir gage and an automatic long range recorder connecting the gaging station below the dam with the operating house. Plans are being made for the reconstruction of the operating facilities of the outlet valves for more efficient operation. The exposed piping subject to freezing is to be adequately protected. It is contemplated that additional work will be done during the low water period of the reservoir so as not to interfere with the normal operation of water releases. Repairs to the frames of the high-pressure gate will have to be made during the low water period because the repairs are on the reservoir side.

Pathfinder Dam is in Region 7 of the Bureau of Reclamation of which A. A. Batson is Regional Director. L. N. McClellan, Chief Engineer, is responsible for design and construction in the Bureau. All activities of the Bureau are under the direction of Michael W. Straus, Commissioner of Reclamation.

## Falcon Dam Authorized By U. S. on Rio Grande

PRESIDENT TRUMAN has signed a bill authorizing the United States to participate in construction of power plants at the proposed Falcon Dam on the lower Rio Grande 75 mi. south of Laredo, Texas. Previously, both the United States and Mexico had approved plans for the big dam and its power plants following their acceptance by the International Boundary and Water Commission.

Cost of the entire project will be approximately $46,065,000. Cost of the two power plants, $12,658,000, will be shared equally by the two countries. Cost of the dam structures will be shared according to the proportion of conservation storage capacity available to each country.

Construction of the project as a cooperative enterprise of the two countries will begin next year. A working model has been prepared at the Denver headquarters of the Bureau of Reclamation, which carried out the design work.

The dam, planned as a rolled earthfill structure, will be nearly 5 mi. long with a maximum height of 150 ft. A large concrete spillway at the dam's left side will limit flood discharge to 60,000 sec. ft. The reservoir, with a maximum capacity of 4,085,000 ac. ft., will cover a surface area when full of 114,000 sq. mi. One power plant will be constructed on each side of the river, each to have a capacity of 10,500 kw.

Commissioners of the International Boundary Commission are L. M. Lawson of El Paso, Texas, and David Herrera Jordan of Juarez, Mexico. R. J. Tipton, consulting engineer of Denver, is technical advisor to the American section of the commission, and Joaquin C. Bustamante is principal engineer adviser to Jordan.

# 24 Tons of Cement Where and When Wanted

FRUEHAUF TRAILERS play a major role in helping Permanente make good its slogan: "On the job—on time." Loaded with 24 tons of cement, each of these four sets (8 units) of Fruehauf Hopper Dump Trailers haul from Permanente to any point in California north of the Tehachapi-Obispo Divide.

In regular, routine operations such steep grades as Pacheco and Cuesta Passes must be descended. Fruehauf 18" x 7½" brakes function perfectly with no semblance of "fade." They insure safe operation under difficult conditions.

With the largest cement plant in the world showing such confidence in Fruehauf Trailers, you should be convinced that Fruehauf really IS the name that carries weight . . . more weight longer and for less.

The Fruehauf Trailer line includes End Dumps, Side Dumps, Hopper Dumps, Low-Beds, Tilt-Decks and "specials" in capacities as desired. Your nearest Factory Branch will gladly supply all details.

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"ENGINEERED TRANSPORTATION"

*World's Largest Builders of Truck-Trailers*

**FRUEHAUF TRAILER COMPANY**

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# Portrait—A Highway Chief Engineer

***A pioneer in highway design and economics, Oregon's R. H. Baldock continues to be fascinated by tough construction problems***

By ARTHUR J. LARSON
Portland, Ore.

A PLEASANT, polite, gracious, efficient individual with always the hint of a grin at the corners of his mouth holds office as the State Highway Engineer of Oregon. Well-built (like his roads), he has a thatch of wavy hair that is always in place and orderly like the engineering mind underneath it.

His friends say R. H. Baldock is one of the most thorough engineers they know. He becomes fascinated with tough construction problems. As a young man, railroads, hydroelectric projects and buildings entranced him.

"It is still a fascination," Baldock states, "to conceive of a graceful, sweeping highway, to study the design, to solve the various problems of construction, and then to ride over the finished road—a source, indeed, of unending satisfaction."

When pictures are requested from a lot of engineers about construction work, they normally bring out a couple of faded ones showing "before and after." When Baldock is asked about progress pictures of road construction, he has them illustrating before, just before, at start, right after start and so on right up to the one of a car sweeping along the wonderful road he's supervised.

Records show that Robert Hugh Baldock was born in July, 1889, at Trinidad, Colo. He started his engineering career with a railroad (A. T. & S. F.). Later, he was with Colorado Fuel & Iron Co., Utah Power & Light Co., Phoenix Construction Co., Northwestern Electric Co. He became a rodman and transitman at Port of Astoria from 1908 to 1915. In that year he went with the Oregon State Highway Commission as district engineer, later became assistant chief engineer and finally was appointed the chief engineer in 1932. Since taking over his duties as state highway engineer, Baldock has supervised the expenditure of $230,000,000.

### Pioneered geometric design

Among the outstanding jobs he's completed, based upon the modern type of design which he pioneered twenty years ago, are the Sunset Highway, Portland's short road to the sea, and a section of the Pacific Highway north of Grants Pass where, by a bold, sweeping location, the Southern Oregon mountains have disappeared as far as the motorist is concerned.

This fall, Baldock states, a new water grade of U. S. 30 from Troutdale to Dodson will be open to traffic. The transformation from the narrow, crooked present road, benched high in the rocky cliffs in the gorge of the Columbia River, to the new, straight, wide road on the shore of the Columbia will be amazing. It took courage to place the road along this mighty river where fills in places are to a depth of 50 ft., but the rock toe-wall and riprap withstood the 1948 flood and held the sand embankment safely.

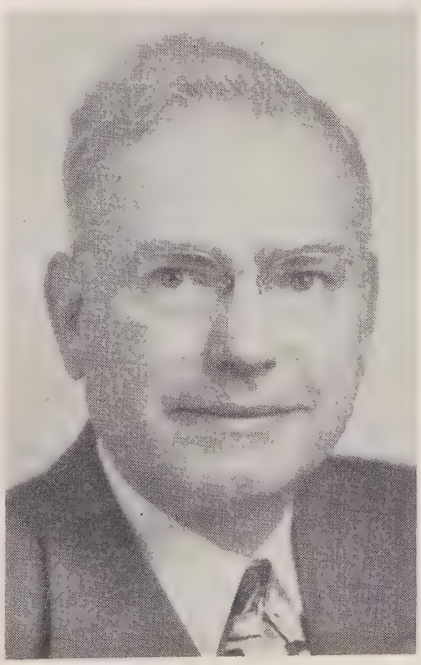
On the Oregon Coast highway (U. S. 101) the Neahkahnie mountain section and the section just north of Newport illustrate the beauty, utility and safety of modern highway design, which Baldock has championed and pioneered for many years.

### Outstanding contributions

He has spent a great deal of time in research. During his tenure of office, there have been more technical investigations made and reports published on various phases of highway engineering and economics than in probably any other state during the same period of time. He can write, too. He was either an editor or a co-editor of many of the publications and a sponsor of the rest. The way he can describe a beautiful highway is something. If he ever wrote a vacation folder about any place it should be a sell-out.

Noteworthy among his many investigations have been various specifications for oiling and bituminous macadam construction which he began in 1923, pioneering this type of work throughout the West. He has been repeatedly consulted by other states to help iron out technical problems in bituminous construction and maintenance. His work on highway design and on highway economics has been an outstanding contribution to the art and science of road building.

R. H. BALDOCK



### A point proved

About 33 years ago, Baldock endeavored to locate the route of a new transcontinental highway (now U. S. 30), from Pendleton to Arlington. The location went straight as an arrow through the wheat fields from Pendleton to Stanfield, crossed the Umatilla River, and then continued by a very direct route to Arlington.

A protest from the small towns split the state legislature and the boys who like to get their pictures in the papers as being duly elected representatives of those small towns set up a howl. As a result the 1917 legislature, by mandate, made the road wind through many of the small towns. The road was 15 mi. longer than the direct line. But the voters were happy.

Sixteen years elapsed after its construction in the early 1920's before it was rebuilt in accord with the original location. Economic studies indicated that enough money was wasted every four years through operation over the old route to have built the new highway.

In recognition of his ability, Baldock was elected President of the American Association of State Highway officials during 1948. He now serves as a member of the executive committee of that association, as well as a director of the Highway Research Board of the National Academy of Sciences. Because of his scientific achievements in engineering, the University of Oregon bestowed upon him the honorary degree of Doctor of Science in 1946.

## Atomic Plant Water Supply

APPROVAL for a $7,500,000 water development program in Eastern Idaho has been given to the Atomic Energy Commission by Idaho State Reclamation Engineer Mark R. Kulp. Included in the program will be a dispersed field system of wells, pumping plants, storage facilities and appurtenances. The water thus obtained from groundwater supplies will be used for industrial and incidental purposes at the big Idaho Reactor Testing Station.

According to L. E. Johnson, manager of AEC's Idaho operations office, water obtained from the approximately 40 primary or stand-by wells but not consumed at the plant will be returned to the area at points determined as safe by the U. S. Geological Survey.

It is planned that work on the water system will begin in mid-December of this year, with completion of the entire program scheduled for late in 1954.

# Construction Design Chart

## CXIV . . . 8-Panel Warren Bowstring Timber Trusses

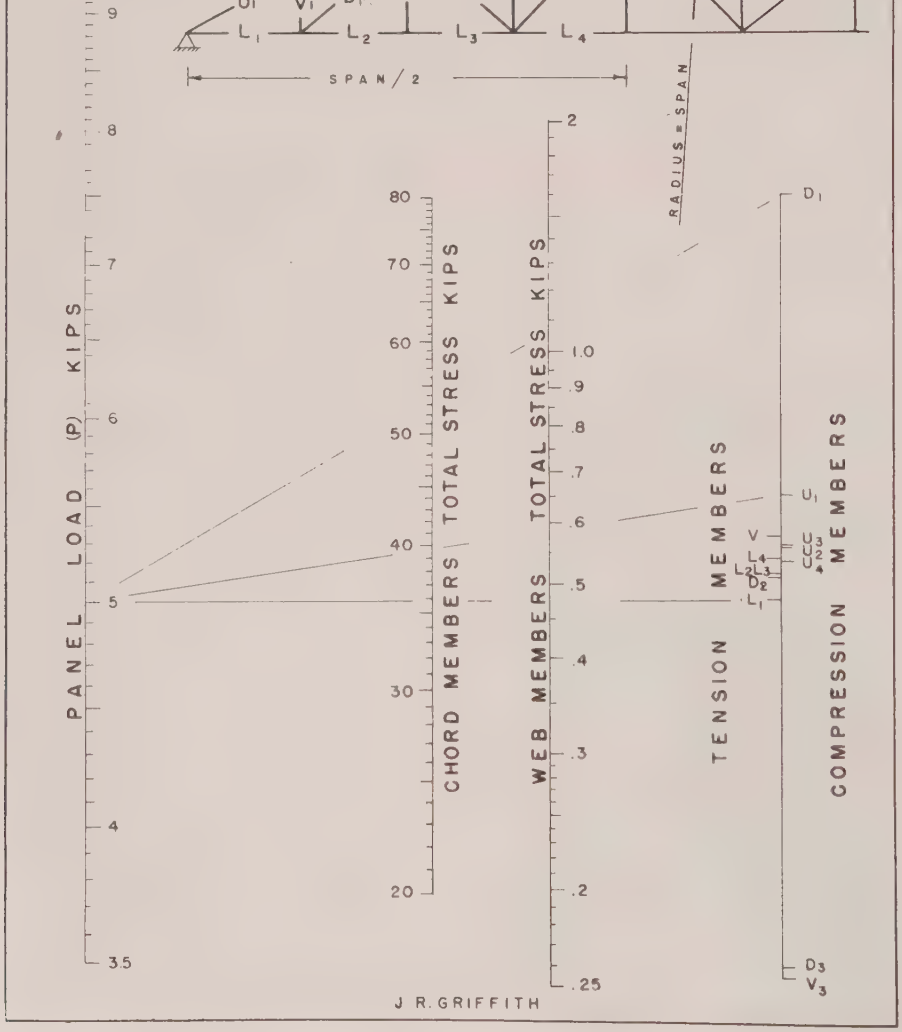
THE ACCOMPANYING chart is the second one of a series to be published on timber bowstring roof trusses. The first one appeared in the Dec., 1948, issue, and will also be found on page 212 of our 1947 reprint.[1] As explained originally, these charts are based on stress coefficients computed by Harold C. Kohl while with Timber Structures, Inc.

By

JAMES R. GRIFFITH

Dean of Engineering
University of Portland
Portland, Ore.

During World War II, I spent considerable time and thought on the development of the most economical covering for temporary Navy storage areas. We never did succeed in devising any covering, even for palletized storage, more economical than timber posts and beams. When it becomes necessary to develop a roof system which will not require intermediate columns, other factors enter to complicate the problem. Some designers will specify massive timber beams spanning from wall to wall, in total disregard of structural economy. If architectural treatment warrants the cost of such beams, the modern glued laminated beam affords the only assurance of obtaining a reliable element. As a general rule when the spans become appreciable, the roof can be more economically supported by a roof truss.




Among the timber roof trusses thus far developed, the modern bowstring truss is one of the most economical. The choice between types, whether Warren or Pratt, will depend largely on the relative number of members and the corresponding framing difficulties. These first two charts on bowstring trusses will permit a quick comparison between the two 8-panel types. As noted on the charts, and originally mentioned, these charts are limited to those cases where the radius of the top chord is equivalent to the span of the truss. Indicative of the economy of the bowstring truss, is the fact that the steel fabricators have been offering to supply this type of truss in welded steel. Providing the top chord radius is equivalent to the span these same charts are applicable to steel as well as timber construction. While most building departments, before issuance of permits, will still require a stress diagram, such charts are advantageous in preliminary design and for checking purposes.

I have drawn three solution lines on the accompanying chart, for determination of the stress in members $U_1$, $L_1$, and $D_1$, under a panel loading of 5 kips. The following total stresses will be noted on the respective scales:

$U_1 = 39.8$ kips, compression,

$L_1 = 35.9$ kips, tension,

$D_1 = 1.07$ kips, compression.

Using the stress coefficients developed by Harold C. Kohl, the total stress in each of the above members would be:

$U_1 = 5.0 \times 7.98C = 39.9$ kips, compression

$L_1 = 5.0 \times 7.17T = 35.8$ kips, tension,

$D_1 = 5.0 \times 0.213C = 1.065$ kips, compression.

It will be noted that the type of stress, tension or compression, is determined on the chart by the side of the member scale the notation appears. Results for the "V" and "D" members will be found on the web member scale, while those for the "U" and "L" members will be obtained from the scale for chord members.

[1] *Construction Design Charts*, Western Construction News.

## Small Canadian Dam Built With Air-Borne Supplies Only

WHAT IS BELIEVED to be the only dam in the world which has been built solely by air-borne supplies is now practically completed 12 mi. north of Vancouver, B. C. The new dam has been erected by the Greater Vancouver Water Board at Palisade Lake.

Twenty-five feet high and 40 ft. wide, the new dam was built under supervision of G. M. Gilbert, Water Board engineer. V. Terry supervised actual construction. Supplies for the dam and men were trucked to Bridge River and then picked up by an Okanagan Air Service helicopter piloted by Carl Agar and Paul Ostrander. The pilots flew gravel, sand, cement, steel, food supplies and men landing on a cleared strip 15 ft. square

## *Washington County With Budget Troubles Has—*

# Small Bridges Designed for Economy

THROUGHOUT the mountainous West, bridges and their upkeep absorb a heavy slice of the road budget of the average county. County Engineers are faced with the perennial problem of keeping initial costs down, in order to service more miles of roads, and of maintaining the completed structures in a safe and usable condition with a minimum of expensive man-hours of work. For these reasons, *Western Construction News* publishes this timely report on low-cost bridge construction in Clark County, Wash.—*Editor.*

By
STEPHEN C. JAYNE
Clark County
Road Engineer
Vancouver, Wash.

BRIDGES currently constitute a serious problem in Clark County, Wash. Many of Clark County's 7,315 lineal feet of bridges are between a poor to hazardous condition, a situation resulting from war-time neglect when materials were difficult or impossible to obtain for the proper maintenance and reconstruction.

In the days before the war, Clark County built many small bridges under the WPA program that consisted of satisfactory concrete abutments with timber superstructures. Timber bridges in this area have a useable life of 10 to 15 years, after which they must be replaced.

Before the war, when timber could be obtained at a reasonable price, bridge replacement was a matter of not too much consequence. Now that prices on timber and accessories have been greatly hiked, a possible solution of the problem was to sidestep timber and its periodic replacement. This has been done with the construction of two pre-cast concrete girder bridges, the first two in a program designed to give the County an expanding list of permanent structures. Under this procedure, the County will be able to devote an increasing portion of its yearly budget to new construction, rather than to maintenance.

### Permanent economy

Apparently, the only way to eliminate the constant bridge maintenance problem was to arrive at some fairly economical type of permanent bridge construction. After studying the alternatives, the County decided that the most promising solution would be in pre-casting reinforced concrete stringers to suit existing abutments; and, in cases where the abutments were not satisfactory or did not exist, to put in the proper type of foundation.

Of course, this type bridge is suitable only for relatively short spans. However the county crews in this case can handle any span or multiple of spans, where more than one is indicated, up to 36 ft. in length. The length of any span is determined to a great extent by the capacity of the hoisting equipment available, and a ¾-cu. yd. shovel crane has been very satisfactory for handling anything up to the 36-ft. length mentioned.

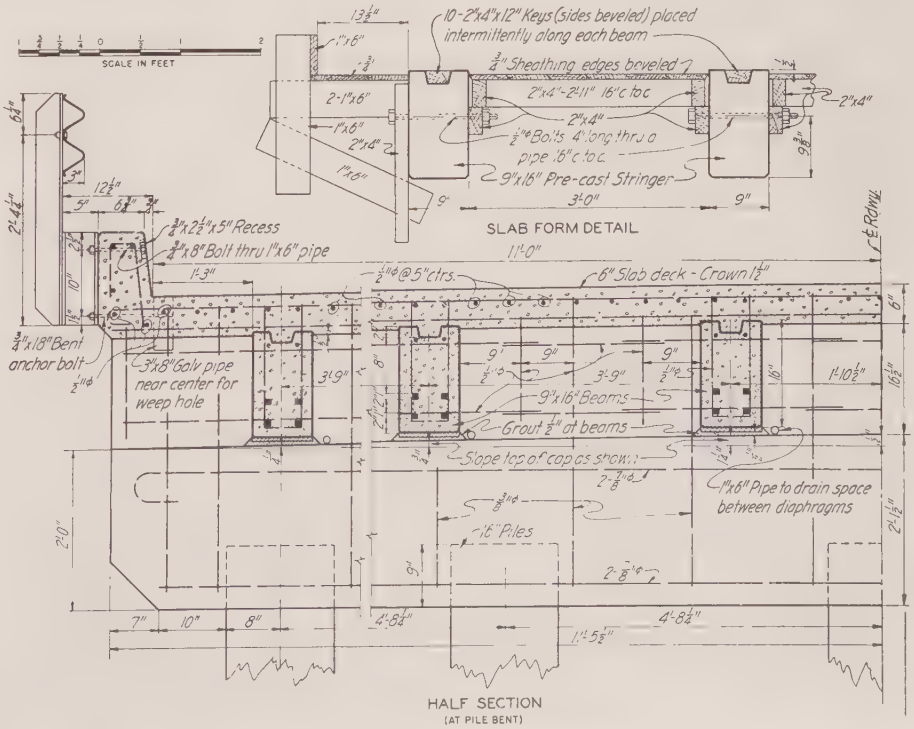
### Two working models

To date, the County has built two bridges of this type. One has a 20-ft. span, with a curb-to-curb width of 28 ft., and the other consists of two 20-ft. spans, constructed between two existing reinforced concrete abutments and with a center pier of five creosoted timber piles, capped with reinforced concrete.

Standardized design in the bridge construction originated in the County Road Department and was checked by the Washington State Highway Department. Meeting with approval, the plans were turned over to the county bridge crews for the fabrication of six sets of forms for the pre-cast stringers. In order to vary stringer lengths and depths, the ends of the forms may be bulkheaded for any desired length up to 24 ft. A movable pallet in the bottom of the forms may be either raised or lowered, as required, to give depths up to 24 in.

Stringer forms were built of simple shiplap with 2 x 4-in. studs and walers, and lined with ¼-in. waterproof plywood. The foundation for the forms consisted of 4 x 12's on 4-ft. centers. The 4 x 12's are imbedded in the ground to a depth of 3 in. and carefully leveled up before setting up the forms. Since all the

**SLAB FORMS, detailed below, are one of the construction features of the bridges that eliminate falsework and minimize man-hours at the job site. The rigid pre-cast stringers act as their own falsework. Bridge decks are poured in the field using a high early strength mix.**


SCALE IN FEET
10-2"x4"x12" Keys (sides beveled) placed intermittently along each beam
¾" Sheathing edges beveled
2"x4"-2'-11" 16" c to c
2"x4"
2"x4"
9"x18" Pre-cast Stringer
SLAB FORM DETAIL
¾"x2½"x5" Recess
¾"x8" Bolt thru 1"x6" pipe
6" Slab deck - Crown 1½"
¾"x18" Bent anchor bolt
3"x6" Galv pipe near center for weep hole
9"x16" Beams
Grout ½" at beams
Slope top of cap as shown
1"x6" Pipe to drain space between diaphragms
16" Piles
HALF SECTION
(AT PILE BENT)

### Design Data For Both Bridges

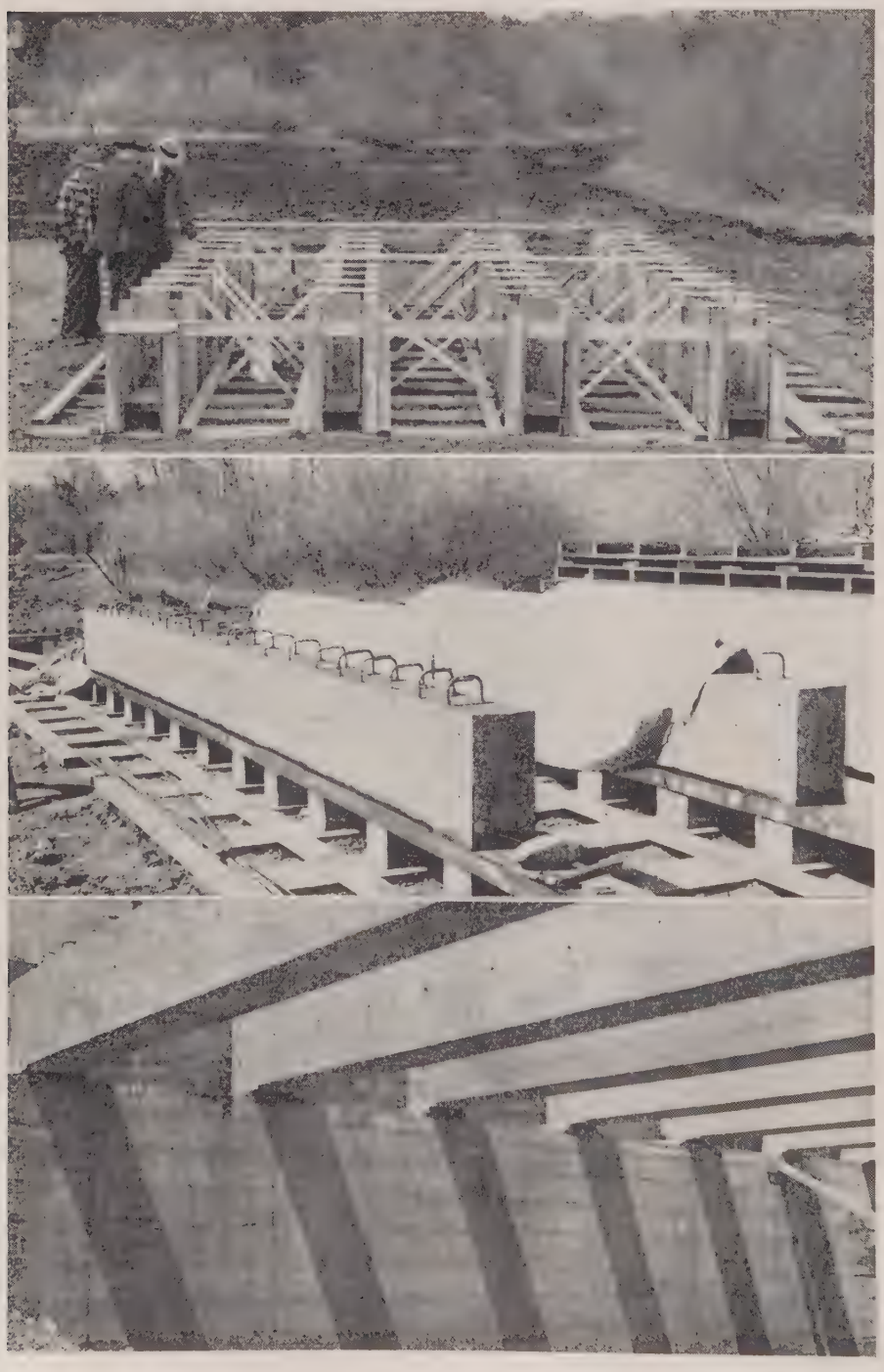
**AASHO Standard Specifications for Highway Bridges**

| | |
|---|---|
| Loading | H-15-S12-44 |
| Clear Width | 22 ft., 0 in. |
| Clear Span | 38 ft., 11 in. |
| Concrete | Class "A," maximum aggregate size 1¼-in., $f_c$ of 3,000 p.s.i. at 28 days. |
| Reinf. Steel | Intermediate grade, deformed, $f_s$ of 18,000 p.s.i. |
| Timber Piling | Pressure treated, using 100% creosote solution with 10 lb./cu. ft. retention, expected penetration of 20 ft. below ground. |
| Beams | Pre-cast, reinforced concrete 9 in. by 16 in. |
| Chamfering | All concrete exposed edges chamfered ¾ in., except ½ in. on beams, or unless shown otherwise. |

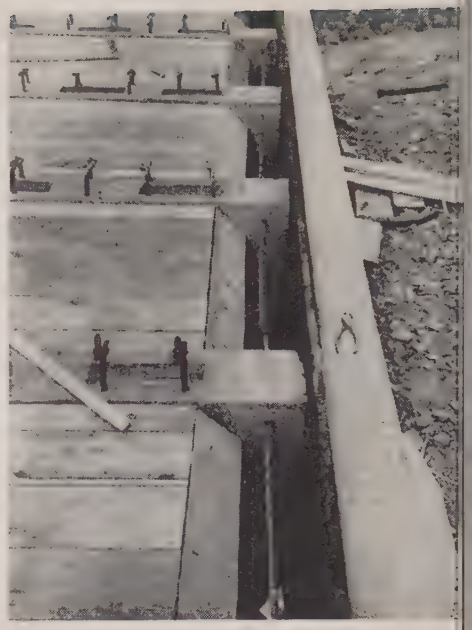
stringers poured to date have been of a standard width of 9 in., the pallets consisted of 3 x 10-in. material sized to this width. The forms were wedged into place on the 4 x 14-in. supports, and nailing strips were used only across the studs, on the top side of the stringer forms. Studs extend 6 in. above the forms for this purpose. With the proper care, the forms may be reused continually, sometimes for a dozen pours. After each pour, the forms are knocked down, cleaned with care, coated with form oil, and stacked so that they will not warp or become misshapen. Deck forms, as shown on the plans, are of simple 2 x 4 and shiplap construction, and are given the same treatment after each pour as the stringer forms.

Reinforcing steel was ordered and bent in Portland, and fabricated by the county crews. Concrete is procured ready-mixed from a local firm, and placed and vibrated by county crews. The steel stirrups on the stringers are welded together near the quarter point in order to keep them from spreading during handling and placing operations.

To accommodate the deck forms, 2 x 4 running strips are placed along the side of each stringer. Deck forms are merely laid upon the strips, requiring no nailing in the field whatsoever, except for special construction as might be required around the ends of the bridge in making proper connections with abutment seats. These efficient running strips are bolted through the stringers, one on each side, through pipes placed on 16-in. centers in the forms at the time of pour. They constitute a very rigid means of bracing and nailing for making connections at the abutment seats. The stringers, being designed to serve as their own falsework, are very rigid and much more satisfactory than a system of timber falsework in the field.



**STRINGER FORMS, secured and ready for the pour (top), will be knocked down after use for cleaning and oiling. Re-used continually, some are good for a dozen pours. After curing, the completed stringer may be stockpiled (center) or moved to the bridge site. Stirrups are welded together at quarter points to form an eye for hoisting slings. In place of abutments, stringers are seated on ½ in. of grout (bottom). Note holes in sides for deck form connections.**



**DECK FORMS in place ready for reinforcing steel. View shows abutment, only place on forms where nailing was required to secure ¾-in. sheathing.**

In order to conserve time, bridge decks are poured with a high early strength mix in the field. This makes the structure as much an integral concrete bridge as one built by conventional methods in the field.

### Cost comparison favorable

All costs are shown in the accompanying box, including excavation costs. In the case of the first bridge, the existing abutments were remodeled to take the new span. It may have proved less expensive in this case to construct entirely new abutments. Although all concrete work is expensive, the cost figures on these bridges compare favorably with those of bridges built by conventional methods in the field. Under similar conditions, bridges of this general size cost in the neighborhood of $10 per sq. ft., based on records of other road-building agencies.

One of the great advantages of this type construction lies in the fact that the bridges can be planned well in advance of construction, and during periods of bad weather the county bridge crew can continue pours and make a stockpile of pre-cast stringers.

### Costs can still be lower

It is well to remember that all initial costs and form expense have been charged to these two bridges. The unit costs on succeeding structures will be somewhat smaller, particularly so as the

### Cost of 20-ft. Span, Including Widening of Existing Abutments and 8 Stringers

| ENGINEER'S ESTIMATE | Unit Price | Total |
|---|---|---|
| 26 cu yd. concrete, Class "A" | $ 65.00 | $1,690.00 |
| 6,000 lb. steel reinforcing bars | .15 | 900.00 |
| 70 lin. ft., flex-beam guard rail | 4.00 | 280.00 |
| 15 cu. yd. hand-placed rip rap | 10.00 | 150.00 |
| | | $3,020.00 |
| Plus 10% Engineering and Contingencies | | 302.00 |
| | | $3,322.00 |

| ACTUAL COST | |
|---|---|
| Indemnity Insurance | $ 10 87 |
| Labor | 1,766.99 |
| Material | 836.15 |
| Supplies | 96.44 |
| Equipment Rental | 277.06 |
| Engineering during design and construction | 365.78 |
| Total | $3,353.29 |
| 574 sq. ft. of bridge deck | Cost per sq. ft., $5.84 |

### Cost of 40-ft. Span Using Existing Concrete Abutments and 12 Stringers

| ENGINEER'S ESTIMATE | Unit Price | Total |
|---|---|---|
| 27.5 cu. yd. concrete, Class "A" | $ 65.00 | $1,787.50 |
| 9,000 lb. steel reinforcing bars | .15 | 1,350.00 |
| 2,450 lb. structural steel, including guard | .25 | 612.50 |
| 175 lin. ft. furnishing timber piles | .50 | 87.50 |
| 5 each driving piles | 84.50 | 422.50 |
| 25 cu. yd. rubble masonry | 20.00 | 500.00 |
| Removing existing structures (lump sum) | | 500.00 |
| | | $5,260.00 |
| Plus 10% Engineering and Contingencies | | 526 00 |
| | | $5,786.00 |

| ACTUAL COST | |
|---|---|
| Indemnity Insurance | $ 48.09 |
| Labor | 2,955.46 |
| Material | 1,796.52 |
| Supplies | 217.73 |
| Equipment Rental | 972.33 |
| Engineering design and construction | 348.42 |
| Total | $6,338.55 |
| 924 sq. ft. of bridge deck | Cost per sq. ft., $6.85 |

county bridge crews become more familiar with this type construction. Once at the site, the time required by the crews to place 8 stringers was 1½ hr. on the first bridge. On the second, 12 stringers were placed in 2 hr.

Of the total length of bridges in Clark County (about 7,300 lin. ft.), about 75% of the footage is in small bridges such as those just discussed. Before taking employment with Clark County it had not occurred to the author that small bridges constitute as much of a problem as they do. Many county engineers have undoubtedly run into the same problem, and this information is offered as a possible solution to the low-cost bridge construction necessary in other counties.

# Firms Should Submit Information if Interested in Atomic Station Work

IN ORDER that pertinent information be available in the Idaho Operations Office of the Atomic Energy Commission, a list of information to be furnished by firms interested in engineering and/or construction work at the Nuclear Reactor Testing Station has been released by Allan C. Johnson, Director, Division of Engineering and Construction, Idaho Operations Office. Contracts for engineering services are awarded on a lump-sum basis or, if that is not feasible because work cannot be clearly defined, on cost-plus-a-fixed-fee basis. Normal commission practice is to award lump sum and unit price contracts for construction services after competitive bids have been received through formal advertising. Circumstances occasionally preclude competitive bidding and necessitate following the selective method of award.

Any firm interested in being considered for engineering or construction work should submit the following information in letter or brochure form if they have not already done so, Johnson stated.

1. Types of work they feel qualified to do and are interested in being considered for.
2. Present commitments by individual jobs, type of jobs, starting and completion dates, estimated costs.
3. Volume of work in last ten years.
4. Trades and services normally performed with their own forces.
5. Work performed by their own forces on complex mechanical and electrical equipment projects, outlined in detail.
6. Background of qualified key personnel available for assignment to any given project.
7. Experience in Mountain States Area.
8. Past record in performing work for the Commission or other government agencies, stating specific jobs, location, year, approximate cost and contracting agency.
9. Copy of latest financial statement.
10. Types of contracts they are interested in, i.e., lump sum, unit price, fixed fee.

A limited number of project photographs, if included with the above information, might serve to indicate the types of work previously performed.

Johnson stated that these data should be sent to: Contract Board, U. S. Atomic Energy Commission, Idaho Operations Office, P. O. Box 1221, Idaho Falls, Idaho.

## USBR Asks Bids for Grand Coulee Reservoir Clearing

THE BUREAU of Reclamation has requested bids for clearing the Upper Grand Coulee of Eastern Washington, where a 27-mi. equalizing reservoir for the Columbia Basin Project irrigation system will begin forming early in 1951. Bids on the work will be opened at Coulee Dam on Jan. 4, 1950.

The clearing job will cover removal of all trees, stumps, sagebrush, fences, old buildings, and debris from a 27,000-ac. expanse extending from the North Dam, about 2 mi. from Grand Coulee Dam, to South Dam, near Coulee City.

Under terms of the contract, the successful bidder will be permitted to salvage any of the material for resale. Included in the area are the abandoned Columbia Basin Orchards containing approximately 10,000 apple and pear trees, many of which are dead.

## Lincoln Announces Welded Bridge Design Competition

THE TAXPAYERS OF the United States have an estimated $10,000,000,000 invested in bridges and spend an estimated $100,000,000 every year to maintain them. To promote the building of better bridges for less money, The James F. Lincoln Arc Welding Foundation is sponsoring the second "Welded Bridges of the Future" program.

A first award of $5,000 will be made for the best design submitted in the 1950 program of a welded 250-ft. highway bridge. The second award will be $2,500, the third, $1,250. Ten honorable mention awards of $200 each will also be given. The competition opens Nov. 1, 1949 and closes June 30, 1950.

The all welded bridge to be designed is a two-lane through highway bridge with a span of 250 ft. The type of steel and the loading conditions for the bridge are specified, but these are the only limitations by the program on designers' ingenuity and originality.

The rules and conditions brochure may be obtained by writing to The James F. Lincoln Arc Welding Foundation, Cleveland 1, Ohio.

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NEWS OF WESTERN CONSTRUCTION

DECEMBER 15, 1949

# P. G. & E. Wins in Fight Over Development of Kings River

AN OPINION and order has been issued by the Federal Power Commission authorizing issuance of a 50-year license to Pacific Gas and Electric Co. of San Francisco, for the construction and operation of a hydroelectric development on Helms Creek and the North Fork and the main channel of Kings River in central California.

The Commission at the same time (1) authorized an amendment of PG&E's license for its existing Balch plant on the North Fork of the Kings River to permit enlargement of the installed capacity from 40,000 hp. to about 160,000 hp.; and (2) authorized issuance of a preliminary permit to Fresno Irrigation District for investigation of the proposed development of a power plant at the Pine Flat Dam, now under construction by the Army Corps of Engineers, on the North Fork of the Kings River.

The Commission refused to reserve development of the Kings River Basin for the Bureau of Reclamation, which had opposed the PG&E and Fresno District applications on the grounds that the Bureau planned development of the Central Valley, including the Kings River projects.

The Commission pointed out that last Aug. 15 the President returned the Secretary of the Interior's report on the Reclamation Bureau's plans with the comment that they did not contain "sufficient information with respect to engineering and economic feasibility to justify their approval as a comprehensive valley plan." As a result of the President's directive, FPC continued, the Secretary of the Interior revised his recommendations to exclude the Upper Kings River power projects from the list of projects for which he requested authorization from Congress.

Stating that "we are confronted with the suggestion that we should withhold approval of the pending applications and reserve development of these water resources exclusively for the United States on the possibility that at some time in the future a more economic plan of development may be worked out . . .", the Commission said that "we are unable to agree with the Bureau of Reclamation . . . that development of these particular water resources should be reserved exclusively for possible development by the United States."

Fresno Irrigation District had requested a preliminary permit in order to secure and maintain priority for license while procuring data necessary to submit an application for a license covering the same facilities covered in PG&E's application, with the exception of Helms Reservoir and a small power plant at the Wishon dam, but adding the power plant at the Pine Flat dam for which the PG&E did not seek a license. Commenting on the District's application, the Commission noted, among other things, that the power company proposed to install in the North Fork plants a total of approximately 274,000 kw. of generating capacity, while the Fresno District proposed to install about 144,000 kw.

FPC found that the generating capacities proposed by the company must be installed in order to fully utilize the waters of the North Fork to their utmost economic value for power purposes. Fresno District, however, the Commission continued, should be given a preliminary permit for the power plant at the Pine Flat dam since it could then perfect its plans for serving some of the essential pumping requirements of its members without the possibility of becoming dependent upon the power company, which would be the only customer for power if the District sought to carry out its proposed development on the North Fork.

Pacific Gas and Electric, under the 50-year license authorized by the Commission, will construct the Helms reservoir with 102,500 ac. ft. of storage capacity, the Wishon reservoir with 128,000 ac. ft. of storage, and power installations at Wishon, Haas, and main stem Kings River sites of about 223,000 hp. or 159,000 kw., for a combined total generating capacity in the several plants of about 274,000 kw.

## Repair Work Resumed On Irrigation Systems

MUCH NEEDED irrigation system repairs and betterment work, delayed because of World War II labor and material shortages, will be resumed at once by the Bureau of Reclamation on 12 projects affecting 1,650,000 ac. of irrigable land in 9 Western States, according to an announcement by the Bureau.

**TWELVE LARGE STEEL RESERVOIRS FOR LONG BEACH WATER SUPPLY**

**A TOTAL water storage capacity of 40,000,000 gal. is being provided at Long Beach, Calif., by construction of 12 Chicago Bridge & Iron Co. butt-welded steel tanks with steel framing and wood roofs. The additional water supply, obtained from the Metropolitan Water District, will feed by gravity into the city's distribution system.**

**FREE BEER FOR CONSTRUCTION CREWS ON RENO'S GOLD-PAVED ALLEYS**

**CONSTRUCTION on Reno's golden alleys pauses as every man on the job gets a free beer from nearby Harold's Club. This hospitable custom was continued throughout the project making it one of the most popular jobs in Reno. For details of the "Streets of Gold" project, see *Western Construction News* for June 15, 1949, page 74.**

Approval of a $2,500,000 appropriation for the emergency undertaking, coupled with enactment of Public Law 335, providing authority for the scheduling of payments, under appropriate contract arrangements, by which water users will return to the Government rehabilitation expenditures, makes it possible for the Bureau to proceed with the work.

The tentative schedule of rehabilitation work to be performed by the Bureau of Reclamation in the current fiscal year includes the following projects and amounts, subject to repayment contracts to be executed by the irrigation districts concerned:

Salt River Project, Arizona, $350,000: For examination and surveys, concrete lining of canals and laterals, replacement or installation of pipelines, and for the repair or replacement of concrete structures. There are seven storage reservoirs, three diversion dams, 201 pumping plants, and over 1,400 mi. of canals, laterals, and drains on this project, which encompasses approximately 240,000 ac. in the vicinity of Phoenix.

Yuma Project, Arizona - California, $150,000: For replacing old wooden structures that are beyond repair, lining canals and laterals to prevent loss of water and reduce the amount of seepage, and rehabilitating canals and laterals, including concrete structures that need repair or replacement. This is one of the earliest projects constructed by the Bureau and has an unlined canal and lateral system.

Boise Project, Idaho, $70,000: Installation of drill holes determine the extent of repair required on the downstream face and apron of the Black Canyon Dam.

Bitter Root Project, Montana, $50,000: Replacement of gates on the Lake Como Dam, diversion dam and head gates, wooden flumes and other structures.

Milk River Project, Montana, $138,500: Relocation of a section of St. Mary's canal and work in connection with canal and lateral systems on the Glasgow Division of the project; drainage work on the Malta Division.

North Platte Project, Wyoming-Nebraska, $200,000: Canal lining for the Gering-Fort Laramie and Goshen Irrigation Districts, where seepage conditions have become increasingly serious, with considerable land being reduced to a non-productive basis.

Rio Grande Project, New Mexico-Texas, $450,000: Installation of measuring devices, construction of turnouts, construction of structures providing a by-pass regulating canal, and replacement of bridges.

Belle Fourche Project, South Dakota, $154,500: Replacement of outlet control valves in the Belle Fourche Dam and other work.

Yakima Project, Washington, $180,750: Work on the Keechelus dam and spillway, Kachess dam and outlet works, and the Bumping dam and spillway. The Yakima project was one of the first projects approved under the Reclamation Act, this approval taking place in 1905.

Riverton Project, Wyoming, $676,000: Many of the irrigation facilities on the Midvale Irrigation District are in need of repair and replacement, canals need lining or relining, and a continuation of the drainage program is necessary.

Shoshone Project, Wyoming, $241,000: Replacement of wooden structures and concrete structures which have been subject to deterioration by alkali soils and water for 30 years and rehabilitating old and constructing new drains.

## Offices Set for Water Transfer Plan Studies

OFFICES of the United Western States investigation authorized by Congress to be carried out by the Bureau of Reclamation have been established in Salt Lake City. The investigation was formally initiated early in 1949, and will probably reach the preliminary report stage in 1952. The engineer in charge of the studies for the Bureau is S. P. McCasland.

The United Western project is the official study of the long-considered and much-discussed diversion of the excess waters of the Columbia and other Northwest rivers to inadequately watered areas of California and the Southwest. The first work is more in the nature of a reconnaissance to determine the desirability and justification for more detailed studies on the water transfer plan.

The scope of the investigation is so immense that no specific information has yet been made public. The work will generally be carried out by the Regional offices of the Bureau, at the suggestion and under the general direction of the Salt Lake City office. Reports from the Regional offices will be correlated in the latter headquarters and the final report written there.

The preliminary studies will embrace the following matters: 1. maximum ultimate water and power needs of the Pacific Northwest; 2. the surplus waters which may ultimately be available in that area; 3. the maximum ultimate needs for water supply and the water resources of the arid areas under investigation; 4. the general scheme by which needs of the arid zones may be met to the extent of local supplies; 5. the plans by which any surplus waters may be imported into areas of deficient supply; 6. the feasibility of exchanges which might permit greater upstream utilization of the water resources of the Colorado and other rivers; 7. the effects of diversions and exchanges of water on the present or potential production of electric power; 8. the feasibility of developing new power supplies incident to the proposed plans, or independently to offset any adverse effects of such plans.

If it is determined that surpluses do exist in Northwest streams, it then becomes essential to consider feasibility of transporting it to points of deficiency. Numerous routes, both pump and gravity, have been suggested, but due to the insufficiency of study, no statement can yet be made with reference to any of them. It is emphasized, however, that the investigation will not be confined exclusively to the Columbia River, but also to the Trinity, Klamath, Smith, Rogue, Umpqua, Yaquina, and other streams now wasting into the ocean. Similarly, it is strongly noted that not only California is being considered as the beneficiary of any plan which may ultimately be developed, but that all water-deficient areas will be studied with a view to aiding them with surplus waters from the Northwest.

# Alterations to Approaches of San Francisco Bay Bridge Recommended

THREATENED WITH a further complication in the San Francisco Bay crossing problem, the California Toll Bridge Authority on Oct. 31 received a report and estimated costs from the Division of San Francisco Bay Toll Crossings, its special engineering agency, proposing additions and corrections to the on and off ramps at the San Francisco end of the existing Bay Bridge, certain alterations to the structure itself, a new approach at the Oakland end, and a new tube connecting Oakland and Alameda.

More than a year ago the Division prepared a report favoring construction of a duplicate and parallel bridge for the purpose of relieving the extremely heavy congestion now existing on the bridge, and in accepting the report, the Toll Bridge Authority indicated that it would push for immediate construction of the parallel span. Meanwhile, however, the protests received from citizens and engineers favoring some other type of crossing has been so great that hope of any immediate construction is gone, while hearings, studies, and investigations of various other suggested traffic crossings proceed on the local, state, and national levels. Serious question as to the defense value of putting the two crossings immediately adjacent has been raised.

According to the federal law under which authority was granted to construct the present bridge, tolls may not be charged on it after the construction cost is once amortized. Since it is expected that the present rate of toll collections will result in the amortization of the original construction cost sometime in 1952, the Authority would not be able to re-institute charges after that date, and since it is desireable to have both crossings (regardless of which type is finally adopted for a second crossing) on a toll-collecting basis, the matter will be out of the Authority's control entirely by 1952 if something is not done quickly. It is believed that this legal background is the reason for the report prepared between Oct. 17 and Oct. 31, recommending expenditure of an additional $53,000,000 for improvements and changes to the present structure and approaches. By this considerable additional capital outlay, including even the Oakland-Alameda tube, which is completely apart and distantly removed from the Bay Bridge, the Authority could contain fiscal control over the structure until public clamor has quieted and further moves could be made toward building a second crossing.

The specific recommendations in the new report include a new off ramp at Main and Mission Sts. in San Francisco, and a new ramp from Beale and Mission Sts. The estimated cost of these two facilities is placed at $5,272,000. Also proposed on the West Bay end of the bridge is a connection with the Embarcadero, famous waterfront street in San Francisco, at a cost of $6,000,000. Likewise a new approach and connection to the proposed Bayshore Freeway, between the present end of the Bay Bridge Fifth St. approach and Eighth St., in San Francisco is suggested, at an estimated cost of $9,000,000. This will necessitate changes in the present Fifth St. ramp, estimated to cost another $2,690,000.

On the East side of the Bay, it is proposed to construct an overhead approach from a point just east of the present toll plaza to 16th and Cypress Sts., thus affording a much more direct route for traffic destined for downtown Oakland. It is estimated to cost $8,019,000. The Posey Tube connecting Oakland and Alameda under the Alameda Estuary is of 2-lane construction, and is seriously overcrowded. A new tube paralleling it has long been under consideration, and it is proposed in this report to undertake it as a part of the Bay Crossing improvement, at an estimated cost of $12,662,000. Improvements and overhead structures along East Shore Highway north from the bridge are also proposed as a part of this report, at a cost of $3,280,000.

It is proposed to widen the lower deck of the bridge to a full three lanes, and to utilize the extra lane for passenger vehicular traffic during peak rush periods. This cost is estimated at $3,500,000. Further, "if a satisfactory solution" for "increasing safety on the upper deck" can be found, it should be carried out, and $1,000,000 is assigned to the possibility that such solution may be forthcoming. Possible additions to the toll plaza are estimated at $500,000, making a total of $53,000,000 to be added to capital investment.

**ARCH RIBS WELDED TO STRUTS TO MAKE FIXED SPAN FOR COUNTY**

**MAIN ARCH RIBS of this 140-ft. span consist of two 36-in., 150-lb. WF beams built up by Unionmelt welding. The arch was erected as 2-hinged for dead load, and then the ribs were welded to the shoes to form a fixed span for live loading. The bridge was built for Del Norte County, Calif., by Underground Construction Co. under a $75,950 contract. Clarence E. Seage of San Francisco was the consulting engineer.**

## Federal Airport Funds Limited by CAA Ruling

A NEW POLICY statement calling for Federal participation in the construction or improvement of only one runway or strip on new or existing Class I airports under the Federal Airport Act has been announced by D. W. Rentzel, Administrator of Civil Aeronautics.

In addition, the policy states that on all other classes of airports the construction of additional runways will be approved only for the purpose of handling traffic volume, and that runways on which Federal funds are expended will be non-intersecting with any existing runway and must be either parallel or diverging.

Exemptions from the stated policy must be approved by the CAA Washington office on request from the Regional Administrators and must be justified by conditions other than those involving wind coverage.

In making the announcement the Administrator pointed out that single runway airports can be located closer in to communities with less cost of construction. In addition, traffic patterns are simplified and safety increased.

The CAA has encouraged single-strip construction since the Federal Aid Airport went into effect. To date 412 single strip airports have been programmed. Of these 163 have received grant offers, 126 have been programmed but no grant offer made while in 123 cases local sponsors requested withdrawal because they could not meet matching funds.

For the purpose of clarification, it was pointed out that the new policy does not, because of contractual commitments, affect already approved projects.

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# Oregon Counties Lick Wounds, Count Gold

COUNTY engineers are hammering away at their problems again, this time in Oregon, at the Annual Meeting of the Association of County Engineers of Oregon, held Nov. 16-17-18 in Portland. Early arrivals of Oregon's 48 engineers and surveyors were greeted with immediate general business sessions and committee meetings.

Christ Fauerso, Wasco County Engineer, began with a strong and often repeated urge for the improvement of county road department administration, and standardization of engineering practice, cost accounting, and equipment rental charges. An immediate problem facing Oregon County Engineers at this time is the carrying out of the new law for the improvement of dedicated streets, particularly in the numerous "fringe areas" just outside city limits. Persons so located and desiring a road must first circulate a petition among those fronting the right-of-way, and the petition must be approved jointly by 75% of the people involved and the owners of 75% of the front footage.

Petitioners may be given 5 years to repay the county for construction, at the rate of 1/5th of the principal per year plus interest, and they may pay off the remaining balance at any time. If the debt is settled during the first year, no interest is charged. Interest is computed at 8%.

In Lane County, with P. M. Morse as Engineer, a county-wide planning commission is in effect, and no plat is approved until every road is improved to county standards, or bonds put up for the specific period until the roads are improved. County house permits are required under this setup.

In Linn County, with Walter Larsen as Engineer, persons in the fringe areas desiring roads must raise the money for the oil, and then the county gives the gravel and performs the work needed to establish the county road.

President Wally Hector (Klamath County), states that the full "10% for engineering" allowance should be charged toward road work, even though it is not completely used. This is because the 3% rebate on the funds can very possibly add up through the years, leaving a county road department in the red.

A prevalent sentiment of the group favored the forcing of the fringe areas to take care of themselves instead of making the county do the job. Some engineers felt that "They asked for it, by moving out there and accepting the problems—the whole county cannot be taxed to provide for the few."

B. J. McClarty, Division Secondary Roads Engineer, Bureau of Public Roads, pointed out that in the State of Washington, the equipment rental and revolving fund also permits the stockpiling of rock and materials, and that this may be charged against the fund. On Dec. 8, 1949, all county engineers in Washington were required to submit their "10-year plan" for the road department work. Each year's program must conform reasonably to the entire plan, and any work over $2,500 must be planned by the engineering staff.

Featured speaker at the luncheon meeting was B. J. McClarty, who reflected the Bureau of Public Roads interest in the low traffic secondary roads, i.e., those carrying less than 100 cars per day. Concerning the standards on these roads, McClarty said that sometimes it is best not to cut and fill the cross-section to balance, but to let the road roll over the hill, and perhaps rest on select borrow material in the draws. Drainage is the all-important problem here, and not the high design speed.

Ralph T. Moore, Chairman of the Legislative Interim Committee on Highways, addressed the meeting on the "Organization and Administration of County Road Departments." He pointed out that the high benefit ratio, or earning power of modern highways, is in some cases as high as 3 to 1 over old roads. Moore foresaw a future aid to gas tax funds from property owners and community businessmen, since everyone benefits from the roads. The funds must come from somewhere, he stated, and the gasoline tax rate has just about reached its practical limit.

Among the resolutions introduced at the joint engineers and commissioners meeting was a recommendation that the Oregon cities take over jurisdiction of all county roads within their present city limits and within the limits of future annexed areas.

Speaking at the Friday morning session, Clarence Swenson, Assistant Cost Analyst, OSHD, spoke on Construction Equipment Rental Rates, and described the studies made by the state of the contractors' time cycles, methods, and the resident engineers' weekly reports, material, and work orders, to make a formal job report. By a study of present costs, an attempt is made to project price trends in future work.

Emil F. Halik, equipment superintendent, OSHD, spoke on the rental rates as applied to maintenance equipment, and stated that the function of his department is to purchase equipment and charge rental rates to all other departments in the state, in such a way as to amortize the cost throughout the lifetime of the equipment. From more than 3,200 pieces of maintenance equipment, about 80 monthly equipment rental rates are computed and used.

Final speaker on the program was G. W. Harra, Assistant Engineer of Materials, OSHD, who outlined the work in his department and stressed the growing consideration of soils testing and soil mechanics in State Highway work. He stated that research and trouble shooting go hand in hand, and gave examples of paint vehicles, compatibility of aggregates, and asphalts and their penetration. Specifications and tested samples of materials, especially steel and cement, are available at cost to all Oregon counties.

Among the resolutions passed at the final business session of the Oregon County Engineers were a letter of condolence to the family of the late W. C. Galloway, Benton County Engineer; and a life membership to Christ Fauerso, Wasco County Engineer, upon his coming retirement.

New officers for 1950 are Floyd A. Robb, Coos County Engineer, president; D. B. Ambler, Lincoln County Engineer, vice-president; and Paul B. Rynning, Jackson County Engineer, retained as secretary-treasurer.

**BIGWIG Oregon County Engineers, l. to r., are WALLY HECTOR, Klamath Co., Past President; CHRIST FAUERSO, Wasco Co.; PAUL RYNNING, Jackson Co., Secretary-Treasurer, and FLOYD ROBB, Coos Co., President for 1950. In earnest discussion at right are county engineers P. M. MORSE, Lane Co.; FLOYD FREAR, Douglas Co., and WALTER LARSEN, Linn Co. A question hotly debated at the meeting was how to handle city "fringe areas," which many felt are trying to escape obligations.**

## Construction Volume to Continue High in 1950

TOTAL VALUE of new construction to be put in place nationally in 1950 is expected to equal the 1949 record of more than $19 billion.

According to a joint estimate of the Department of Commerce and the Bureau of Labor Statistics, private construction outlays probably will drop about $925 million from the total for 1949, but indications are that public expenditures for new construction will increase by a like amount.

The number of workers employed by construction contractors during the peak month will be about the same as in 1949, around 2,400,000. Somewhat more than a fourth of the construction workers will be employed on residential building at its peak next year, compared with a third this year. Public construction will claim a third of the workers at the height of the 1950 program, compared with a fourth in 1949.

A slackening of the recent unprecedented pace in new homebuilding is foreseen for 1950. Nearly a million new nonfarm dwelling units will have been started in 1949 by the close of the year, shattering all previous records. Indications are, however, that with the higher priced market nearly saturated and costs not likely to decline materially, 1950 will be only one of the better years in homebuilding, with about 900,000 units started. This is less than in the previous peak year, 1925 (937,000), and less than in 1948 (931,300) and 1949. Private housing in 1950 will account for around 830,000 units, compared with nearly 960,000 this year—the all-time high—and 913,500 in 1948.

The outlook is for a decrease in 1950 in most types of private nonresidential building, except for commercial buildings, which may increase slightly as a result of pressure for shopping facilities to serve new residential areas. A substantial increase in hospital and institutional building is assured under the National Hospital Program. Construction of new industrial plants and facilities is expected to drop about 26 per cent next year, continuing the downtrend that has been so marked during 1949, as postwar expansion plans were completed.

The principal privately-owned public utilities probably will carry on a lower volume of new construction in 1950 than this year, except for gas companies, which may increase their construction outlays.

The total value of all types of public construction put in place in 1950 is expected to exceed $6.1 billion, an increase of nearly 18 per cent over the probable $5.2 billion total for 1949. Expenditures in every category of public construction probably will be larger next year, except for military and naval facilities.

Highway construction will advance about 15 per cent in dollar volume to reach $1.9 billion in 1950. Municipalities will expand construction of sewer and water facilities and public utilities to serve growing communities, and the Federal Government will spend larger amounts for river, harbor, flood control, and reclamation works.

Adequate supplies of construction materials are expected to be available for the volume of construction anticipated in 1950, except for some possible steel shortages during the early months of the year. The supply of labor also should be adequate to meet all requirements.

## Big Public Works Program In Alaska Being Organized

JESS LARSON, Administrator of General Services, has assigned Arthur D. Morrell, deputy commissioner for planning, and Lester M. Marx, engineer of the Bureau of Community Facilities, to set up the public works program in Alaska authorized by the last Congress. They are now in Alaska.

Congress authorized $70 million for the program, and has made $5 million immediately available to the General Services Administration "to foster the settlement and increase the permanent residents of Alaska" by providing facilities for community life.

The proposed public works include schools, hospitals and health centers; sewer, water and other sanitation facilities; wharves, docks and harbor facilities; bridges, roads, sidewalks, streets and alleys; college and institutional buildings and facilities, including dormitories, and libraries, fire stations and other public and public service buildings.

GSA will construct the projects and an average of 50 per cent of the cost is expected to be recoverable by long-term sales of the facilities to the communities under pre-arranged agreements. The total program, it is estimated, will involve construction of between 300 and 400 projects in 100 locations.

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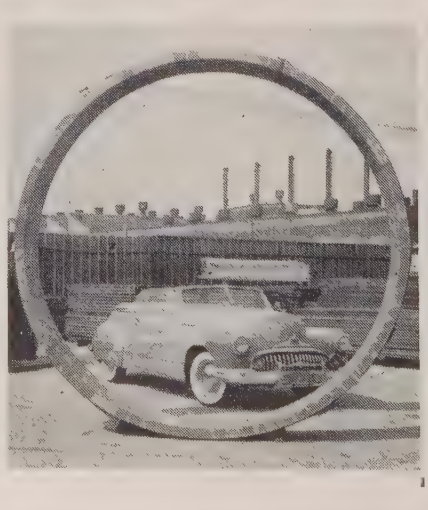
**12-FT. WOOD PIPELINE INSTALLED**

**A HUGE WOOD pipeline, 12 ft. in diameter, has been planned and installed by the Santa Fe Tank and Tower Co., Los Angeles, for the California-Oregon Power Co. at Medford, Ore. Constructed of 4 x 6-in. redwood timbers milled to a curvature inside and out, the pipes have malleable iron clamps to fasten ends of the staves together securely at joints. Section lengths vary from 6 to 20 ft.**



## Reclamation Projects Up for Bidding Soon

THE CHIEF ENGINEER of the Bureau of Reclamation has announced that the following projects will be advertised for bid in the near future. The work and probable date of advertisement follow:

**Dec. 20:** 3 mi. concrete pipeline and structures for a distribution system near Lindsay, Calif.; the architectural finish work on the power plant at Shasta Dam, Calif.; a steel tower transmission line from the Elverta substation to Perkins, Calif., a distance of 18.3 mi.; a wood pole transmission line 38 mi. long from Jamestown to Edgeley, N. Dak.; a wood pole transmission line 70 mi. long from Edgeley to Forman, N. Dak.; and installation of water lines at Boulder City, Nev.

**Dec. 23:** 13 mi. of the East Low canal of the Columbia Basin project near Wheeler, Wash. and the 3.3-mi. Webe wasteway of the same project; 18 mi. of earth-lined section of the Delta-Mendota canal near Firebaugh, Calif. and the 5,800-ft. Firebaugh wasteway; 41 mi. of wood pole transmission line between Bismarck and De Vaul, N. Dak.; 41 mi. of wood pole transmission line from Rugby to Dunseith, N. Dak.

**Dec. 29:** The 2,974-ft. reinforced concrete Olympus siphon and an access road near Estes Park, Colo.; clearing 1,000 ac. of the Boysen reservoir site about 18 mi. south of Thermopolis, Wyo.; and streets, sidewalks and utilities at Parker Dam townsite, Calif.

Additional bid calls expected within the following two months, but for which definite dates have not yet been assigned are:

Cachuma Dam, an earthfill structure 216 ft. high on the Santa Ynez River northwest of Santa Barbara, Calif.; Fort Sumner diversion dam 870 ft. long and 40 ft. high on the Pecos River near Fort Sumner, N. Mex.; a Missouri River diversion dam 650 ft. long and 30 ft. high near Fort Peck, Mont.; Tecolote tunnel 7 ft. in diameter and 6.4 mi. long, near Goleta, Calif., and 80 mi. concrete pipe distribution lines near Lindsay, Calif. and a terminal reservoir for the Salt Lake aqueduct near Salt Lake City.

Canal projects to be advertised soon include: 6.6-mi. of enlargement of the Fire Mountain canal near Paonia, Colo. and 9 mi. of the Superior canal near Superior, Neb. A 10-mi. long section of 48-in. reinforced concrete pipe near Goleta, Calif., will also be advertised. Twelve transmission line jobs will be announced soon. They include 280 mi. of stringing conductors between Davis Dam and Coolidge, Ariz.; 110 mi. of wood pole line from Boysen Dam to Casper, Wyo.; 88 mi. between Sterling, Colo., and Ogallala, Neb.; 61 mi. between Rugby and Devils Lake, N. Dak. and another 56 mi. between Rugby and Voltaire; 55 mi. between Alliance and Chadron, Neb.; 52 mi. between Carrington and Jamestown, N. Dak., and another 50 mi. between Carrington and Devils Lake, N. Dak.; 42 mi. between Kremmling and Oak Creek, Colo.

# PERSONALLY SPEAKING

**M. C. Blanchard,** chief engineer for Santa Fe Railway's Pacific Lines with headquarters in Los Angeles, retired Oct. 31, closing out 31 years of service with the railroad. A member of the American Railway Engineering Association and the American Society of Civil Engineers, Blanchard entered Santa Fe employ in 1902. In 1922, he was named chief engineer of the company's Western Lines with headquarters at Amarillo, Texas, and he transferred to Los Angeles as chief engineer in 1929. Blanchard has been replaced by **L. H. Powell** as Chief Engineer of the company's Coast Lines. Powell was formerly assistant to the chief engineer for Santa Fe at Chicago.

' ' '

BURNS

**Colonel Donald S. Burns** became District Engineer for the Corps of Engineers at Portland, Ore., last month, succeeding **Lt. Col. Donald A. Elliget,** Acting Portland District Engineer since the elevation of **Col. Orville E. Walsh** to the post of North Pacific Division Engineer. Colonel Burns had been Chief of the Engineering Division, Military Construction, Office of the Chief of Engineers, since August, 1947.

' ' '

**Harry C. Vensano** has submitted his resignation as Director of Public Works for the City of San Francisco. Vensano left private business as a consulting engineer in 1939 to become assistant director of public works for the Golden Gate International Exposition. In 1940, he was made public works director for the fair. After a brief return to private practice, he accepted the position as San Francisco public works director. During the last 7 years he directed the largest civic construction program in the history of San Francisco.

' ' '

**H. E. Birge,** formerly an office engineer for Spokane County, Wash., is the new County Engineer for Garfield County, Wash.

' ' '

Several important personnel changes are scheduled in the Walla Walla District of the Corps of Engineers. **Lt. Col. William J. Ellison, Jr.,** who had been on duty as resident engineer at McNary Dam for nearly 3 years, has been assigned to Fort Mead, Md. He will be replaced as McNary resident engineer by **S. G. Neff,** at present the district executive. **Lt. Col. V. Frisby,** recently in charge of railroad and highway relocations for the district, has received orders transferring him to Okinawa, where a large construction program has been authorized. **R. R. Garnett,** now resident engineer in charge of the Richland levee work along the Takoma and Columbia Rivers, will relieve Lt. Col. Frisby on utilities relocations, which include railroads and highways along the McNary reservoir area.

' ' '

Engineer-Former President **Herbert Hoover** is the recipient of two outstanding honors. The National Society of Professional Engineers, at its annual convention in Houston, Texas, named him the "Greatest Engineer of Our Time." The Moles, exclusive organization of heavy construction leaders at New York City, presented him with one of the tenth annual Moles awards for outstanding contributions to construction and for an exemplary career as a citizen. Receiving the duplicate Moles award for this year is **Richard E. Dougherty,** retired vice-president of the New York Central System and past president of the American Society of Civil Engineers.

' ' '

**W. W. Lane,** civil engineer of Phoenix, Ariz., and former State Highway Engineer of Arizona, has accepted the post of Arizona State Land Commissioner. He replaces **O. C. Williams,** who resigned.

' ' '

**L. G. Urquhart,** retired colonel with the Corps of Engineers, has become associated with O. J. Porter and Co., consulting engineers of Newark, N. J. and San Francisco and Sacramento, Calif. Colonel Urquhart, wartime Chief of the Engineering Division in the Office

URQUHART

STEPHENSON

of the Chief of Engineers at Washington, D. C., will be Assistant Chief Engineer with the Porter company, in charge of their Eastern offices. **Commander Lowell J. Stephenson** recently released to inactive duty from the San Francisco Naval Shipyard, where he was Contract Superintendent and Projects Manager of heavy engineering construction contracts for the past 3½ years, has also joined the staff of O. J. Porter & Co. He will act as Construction Engineer for the consulting firm.

' ' '

**William E. Hoy** has been named district manager for the Guy F. Atkinson Co., general contractors, at the company's Seattle, Wash., district office. Hoy has been district manager in the Portland, Ore., area for the firm, where he is succeeded by **H. S. Booth.**

' ' '

**R. J. Newell,** who recently retired as regional director of the Bureau of Reclamation at Boise, Ida., has been named by President Truman to be United States Commissioner for the formulation of an interstate compact providing for an equitable division and apportionment of the water of the Yellowstone River and its tributaries among the states of Wyoming, Montana and North Dakota. Newell is also Federal representative on the Idaho-Wyoming Snake River compact commission.

' ' '

STAMETS

Specializing in the design of equipment for special purposes and product design, **William K. Stamets, Jr.,** has opened offices in Seattle, Wash., as a consulting mechanical engineer. He was formerly consultant to the Morse Chain Division of Borg-Warner Corp.

' ' '

**Philip R. Nalder** has been named assistant district manager of the Bureau of Reclamation's Columbia Basin Project in eastern Washington. He fills the vacancy created by the recent retirement of **R. B. Williams.** After many years of service with the Bureau, Nalder during 1946 and 1947 was assigned to the Bureau's Washington headquarters as chief of the design and construction division and as liaison representative in Washington of the Chief Engineer's office. He returned to the Columbia Basin Project last year as assistant to District Manager **Frank A. Banks.**

' ' '

**E. Lemcke,** chief engineer and manager of the Orange County Joint Outfall Sewer District in southern California, has resigned to go to Houston, Texas, where he will be assistant chief engineer for Fish Constructors Corp., the firm that is building a gas pipeline from Houston to New York City.

' ' '

**J. G. Wright,** formerly principal engineer with **Austin W. Earl,** civil and structural engineer of San Francisco, has joined in partnership with Earl under the firm name of Earl and Wright. The new partnership has offices at 233 Sansome St., San Francisco.

' ' '

**Stanley T. Elcock,** of Redding, Calif., has been named to head an extensive investigational program on proposed

**D. O. NORTON of D. O. Norton & Son., general building contractor, Phoenix, Ariz., is another "Flying Contractor." The firm uses two Ercoupes for job-hopping.**

Central Valley Project developments located within the Delta District, Region II, Bureau of Reclamation. He will supervise field survey and engineering forces engaged in obtaining pre-construction engineering design data for the American River Development. Elcock has been with the Bureau of Reclamation for 18 years.

* * *

**B. Thor Bjornstad** has been named district engineer in the Pacific Northwest for the Austin Co., Engineers and Builders, at Seattle, Wash. A registered professional engineer in the states of Washington, Oregon and Idaho, Bjornstad joined Austin in 1940 as a structural engineer on its special staff at the Sand Point Naval Station.

* * *

**John S. Cotton,** consulting engineer of San Anselmo, Calif., has been engaged by the State of Israel to prepare a master plan and designs for irrigation and power development of Israel.

## OBITUARIES...

**William Albert Webber,** 47, division engineer at Great Falls, Mont., for the Great Northern Railroad, died Nov. 2 after a month's illness. He worked for Montana State Highway Department for several years before entering the employ of Great Northern in 1924. From 1932 to 1937, he was highway inspector for the Idaho Highway Department. He returned to the employ of Great Northern in 1937 as division engineer at Spokane, Wash., and was later transferred to Great Falls.

* * *

**Walter M. Hay,** 86, construction foreman for more than 25 years for a Missoula, Mont., building contractor, died Nov. 22.

* * *

**Fielden Elmer Calvin,** 87, retired contractor of Los Angeles, died Nov. 11.

* * *

**Charles Church More,** 74, Professor Emeritus of Structural Engineering at the University of Washington, Seattle, died Nov. 19. His professional record included service with the Pencoyd Iron Works of Philadelphia, the American Bridge Co., U. S. Engineers, the Chicago, Milwaukee & St. Paul Railway and consulting work in the field of structural engineering. He was a life member of the American Society of Civil Engineers.

* * *

**John H. Brugh,** manager of the Salem, Ore., office of the J. Wesley Webb Construction Co. for several years, died suddenly Oct. 21 on a train near Rawlins, Wyoming.

* * *

**Bernard William O'Toole,** 62, bridge engineer for the Utah State Road Commission for 25 years, died Oct. 31 at Ogden, Utah. At the time of his death, he was in the employ of the Idaho Bureau of Highways.

* * *

**J. Elmer Nelson,** 78, civil engineer of Glendale, Ore., died Oct. 28. Early in his career he was in the railroad construction field, first for the Western Pacific Railroad in California, then in Canada, and finally for the Portland Railway Light & Power Co. After a period as resident engineer for the Oregon State Highway Department, he entered the private contracting field and built several units of the present U. S. Highway 99.

* * *

**Texas Leon Finch,** 52, building contractor of Phoenix, Ariz., died Nov. 16.

* * *

**Lewis E. Mathews,** 29, civil engineer of Los Angeles, died Nov. 5.

* * *

**Carl L. Williams,** 62, superintendent of irrigation for the Salt River Valley Water Users' Association at Mesa, Ariz. for the past 7 years, died Nov. 15.

* * *

**Pete Diedrich,** 68, Chief Engineer of the Glendale Public Service Dept. at Glendale, Calif., for 30 years, died Nov. 1.

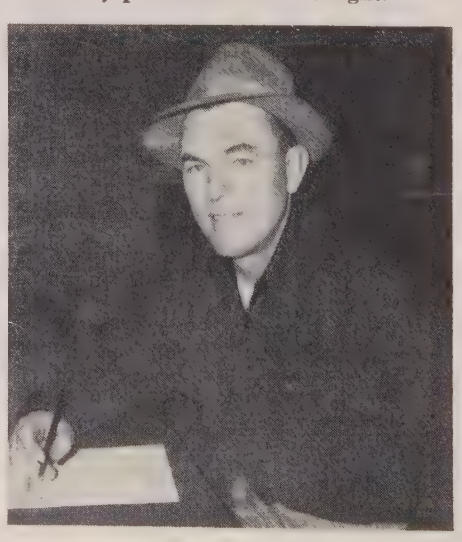
* * *

**John C. Nicoll,** 46, contractor of Los Angeles, died Oct. 27.

# SUPERVISING THE JOBS

**George Stiers** is the general superintendent for C. F. Lytle Co. and Amis Construction Co. at the $5,000,000 Cambridge Dam being constructed for the Bureau of Reclamation near Cambridge, Neb. Assistant superintendents are **Harold Cross** and **F. C. Godsey. Harley Bullard** is master mechanic. **Guy Strouthers** is carpenter superintendent and **W. J. Cochrane** is steel superintendent. Foremen on the job include **Ralph Cross, Harry Chastain, Clarence Self, Red Milam, R. L. Metcalf, Lowell Cooper, Carl Self, Cecil Hutchins, David L. Maupin, H. D. Wilkins, Clyde Foster, A. L. Cullar, Albert Allen, Jim Brock, Howard Wilson, Bob Ledinghan, Earl Vick** and **Keith Stevens.** The job is being completed in December.

**HAROLD E. BUCKERT is the general superintendent for Morrison-Knudsen Co., Inc., on construction of the $17-million Boysen Dam and Powerplant in Wyoming. Other key personnel listed at right.**



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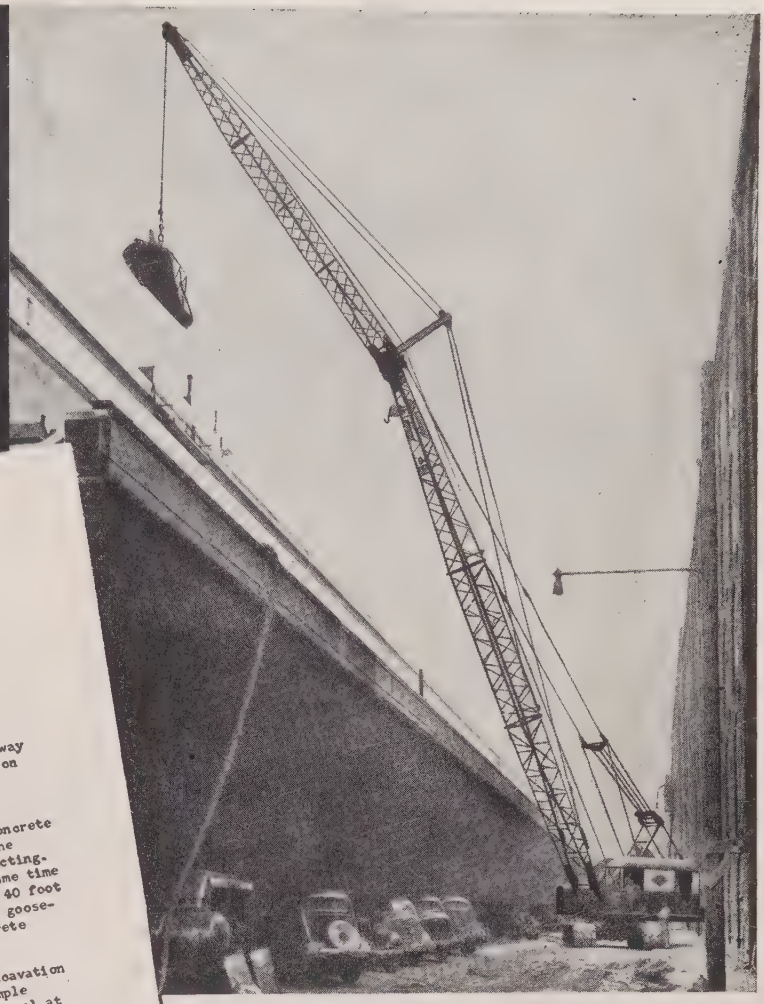
**B. "Woody" Williams** is the project manager and **Harold E. Buckert** is the general superintendent for Morrison-Knudsen Co., Inc., on the $17,000,000 construction of Boysen Dam and Powerplant 20 mi. south of Thermopolis, Wyo., on the Bighorn River. The job includes relocation of the C. B. & Q. railroad around the dam site. **H. I. Maxwell** is tunnel superintendent, and **Paul Lytit** is mixing plant superintendent. Other superintendents are **O. Hankins,** rigger; **J. Rofferty,** carpenter, and **O. J. Doly,** excavation. **P. Crudimsky** is master mechanic. **C. D. Chetstone** is the chief electrician and **J. R. Barry** is the job engineer. **R. R. King** is the field engineer, and **J. F. Donovan** is the safety engineer. **R. I. Gutru** is the job office manager. Foremen include: **T. Bailey Lee,** shovel; **George Backley,** drilling; **Max Graham, Lloyd Hixon** and **Grant Ferre,** concrete. **R. J. Enos** is the purchasing agent, **G. Roork** is camp steward, **George Boil** is paymaster and **Ed Johnson** is the job accountant.

* * *

**E. B. Fontaine** is the project manager and **Theodore F. Adams** is the general

# LIMA TYPE 802 SHOVEL and CRANE COMBINATION

## Solves an "unusual" Construction Problem



TELEPHONE
TALMADGE 8-2000

DEL BALSO CONSTRUCTION CORPORATION
500 ZEREGA AVENUE
NEW YORK 01, N.Y.

October 15, 1948

Construction Equipment Corporation
11-22 Forty-Third Avenue
Long Island City 1, N. Y.

Gentlemen:

As of the time of writing this letter, we have been working on the construction of the Brooklyn-Queens Connecting Highway for about two years and during all that time the two key machines on this project have been the Lima 802 shovel and crane combinations which we purchased from you.

As you know, this contract presented an unusual concrete placing problem because of the narrowness of Furman Street and the height of the three deck cantilever highway which we are constructing. We were forced to work very close to the structure and at the same time had to effect maximum reach. To do this, as you know, we put a 40 foot adjustable jib on a 70 foot boom to give us what in effect is a goose-neck. We have been pouring approximately 40,000 yards of concrete to-date with these two machines.

Our contract also involves a sizeable shovel excavation job which had to be done sporadically. We found it a very simple operation to change one of these machines from a crane to a shovel at very short notice.

In addition, during the past two years we have not shut the machine down at any time for repairs due to breakdown or mechanical failure.

We have been most pleased with the performance of these rigs and their adaptability to meet a special and very difficult situation.

Very truly yours,

DEL BALSO CONSTRUCTION CORPORATION

On this job, the crane operator had to work "blind" most of the time. Traffic had to be maintained, ruling out gantry-type cranes. Heavy equipment was barred in this residential area. The only effective way to place concrete and other materials was with a crane that combined the ultimate in *flexibility* and *capacity*. LIMA 802's did the job perfectly!

Machine illustrated has 70 ft. boom, 40 ft. jib and 2 yard bucket. Note that clearance at rear of machine and front of boom is practically nil.

*The two standard LIMA 802 combination machines owned by Del Balso have worked safely—under UNUSUAL conditions—for two years without "down-time"—a tribute to their tremendous reserve of lifting power and capacity. The LIMA line includes Shovels ¾ to 6 yds., Cranes 13 to 110 tons and Draglines variable.*

**LIMA EQUIPMENT SOLD AND SERVICED BY:**

**Our Seattle Office:** 1932 First Avenue So., Seattle 4, Washington

**Our San Francisco Office:** 1315 Howard Street, San Francisco 3, California

***Sales Agents:***

**Feenaughty Machinery Co.,** 112 S. E. Belmont St., Portland 14, Ore.
**Feenaughty Machinery Co.,** 600 Front St., Boise, Idaho
**Smith Booth Usher Co.,** 2001 Santa Fe Ave., Los Angeles 54, Calif.
**McCoy Co.,** 3201 Brighton Blvd., Denver 5, Colo.
**Contractors' Equipment & Supply Co.,** Springer Bldg., Albuquerque, N. M.
**Tulsa Equipment Co., Inc.,** 418 East 2nd St., Tulsa 3, Okla.
**Modern Machinery Co., Inc.,** 4412 Trent Ave., Spokane 2, Wash.
**Foulger Equipment Co., Inc.,** 1361 South Second Street West, Salt Lake City 8, Utah
**Acme Iron Works,** Culebra Ave. at Expressway, N.W., San Antonio, Texas
**Thompson-Sage, Inc.,** 400 South Wilson Way, Stockton, Calif.
**Jameson Engineering Sales,** Fairbanks, Alaska
**Buran Equipment Co.,** 777 - 100th Ave., Oakland, Calif.

# Lima Shovel and Crane Division

LIMA, OHIO

LIMA HAMILTON CORPORATION

OTHER DIVISIONS: *Lima Locomotive Works Division; Niles Tool Works Co.; Hooven, Owens, Rentschler Co.*

superintendent for Wunderlich Contracting Co. on the $4,787,874 construction of the Olympus and Pole Hill tunnels of the Colorado-Big Thompson Project near Estes Park, Colo. Foremen on the job include **Eugene D. White, Loren B. Huffman, Fares Pacheco** and **Robert J. Silva. Hugh D. Wolcott** is master mechanic, and **R. Frank Johnson** is the chief electrician. **Rayford H. Wilson** is the job office manager. **Don K. Hill** and **David P. Morse** are the job engineers. **Kenneth Canum** is parts superintendent, and **R. A. de Rusha** is paymaster.

* * *

**Albert J. Vala** is the general superintendent for Parker-Schram Co., Portland, Ore., on construction of 2.7 mi. of levees along the Columbia and Yakima Rivers near Richland, Wash., for the Corps of Engineers. Grading foremen are **Al Hughes** and **A. K. Dykeman. Ed Obannon** is pipe foreman and **Jack S. Doyernam** is foreman. **Royce Child** and **Larry Child** are the shovel operators.

* * *

**Roy Hill** is the job superintendent for Peter Kiewit Sons' Co. on a contract for grading and plant-mix surfacing of a 7-mi. section of divided-lane highway near Gorman, Calif. Other supervisory personnel on the job include **John McLaughlin,** project engineer; **O. K. Hoeppner,** office manager; **Brint Turner,** curb foreman; **Harry Coffman** and **Toots Powell,** scraper and dozers; **Fred Welsh,** Tournapulls; **Lonnie Lawler** and **Jack Dougherty,** shovels; **Ra Hultquist** and **Joe Nordberg,** pipe work **Al Aleridge** and **Berle Grounds,** crusl ers; **Al Robbins,** lubrication; **Al Gra** and **Ernie Lane,** equipment maint nance. **Tom Kelly** is in charge of th paving. **Lester Cotton** is the plant for man, and **Wilbur May** is in charge hauling units from the plant. **Tod Smith** is directing the fine grade and la down crews.

* * *

**Ed M. Raimer** is superintendent f Guy F. Atkinson Co. on the $914,15 contract for removal of historic Fo Moore Hill in downtown Los Angel to make way for construction of th Hollywood Parkway. **Dutch Kerbach** excavation superintendent. **A. J. Ca penter** is truck dispatcher and **Jake Bil** is master mechanic. **William Elwing** business manager and **Card Trull** timekeeper. **Cal Canady** is chief ele trician and **Ed Rice** is operating eng neer.

* * *

On the $4,486,000 contract for th construction of the Islais Creek sludg treatment plant for the City of Sa Francisco, **Elmer Cross** is the superin tendent for MacDonald, Young & Ne son Co. and Morrison-Knudsen Co joint venture contractors. **Ed Kemp** an **Bill Meuting** are the carpenter foreme and **A. E. Newton** is the job enginee

* * *

**Buck Fink** is the superintendent an **Anton Grevstad** is assistant superin tendent for Duncanson & Harrelson o construction of the Islais Creek bridg in San Francisco. **Curly Lewis** is ca penter foreman, **Robert Dashiel** is jo engineer, and **Gil Gilbertson** is pil driver foreman.

* * *

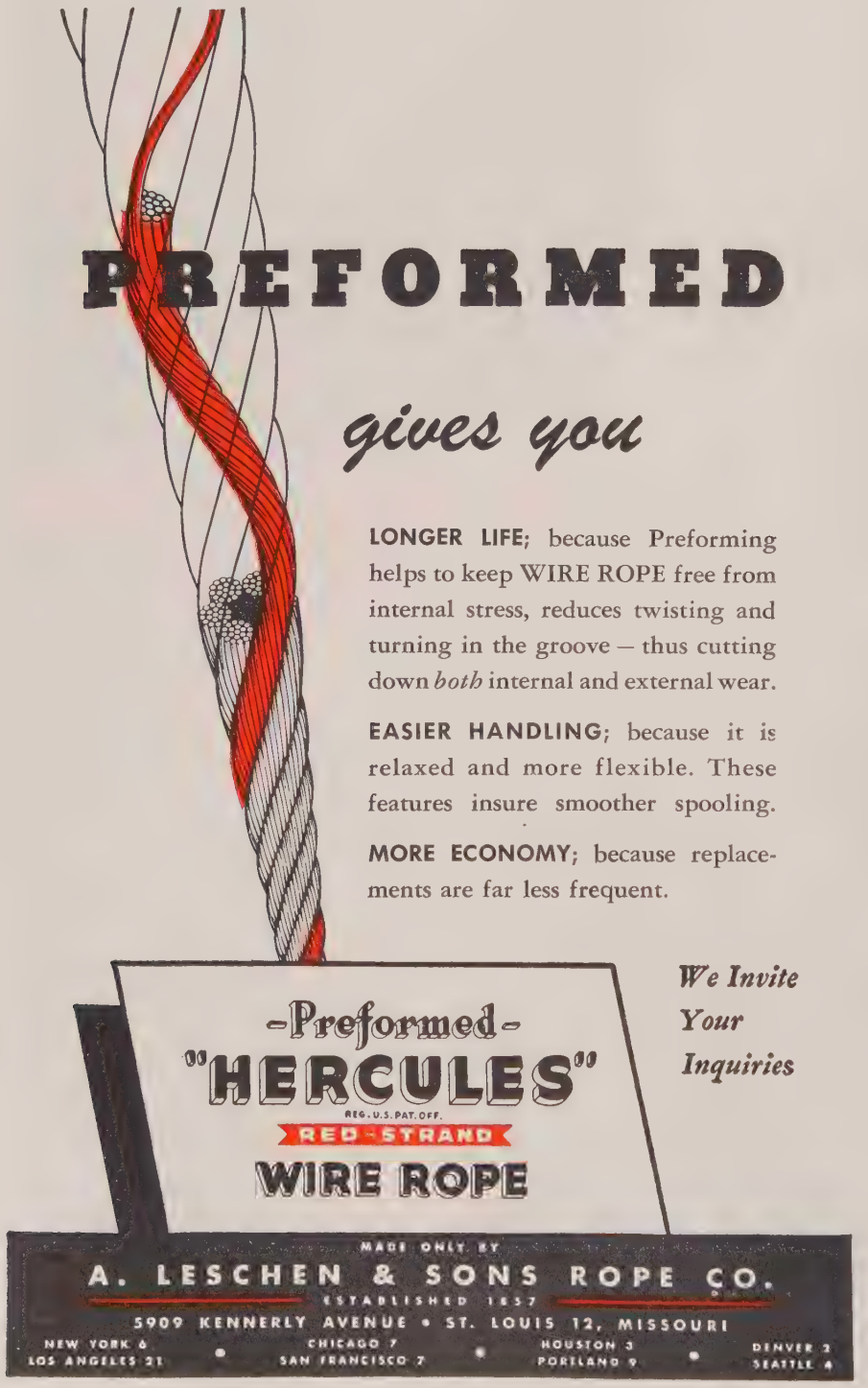
**Louis A. Stiles** is the general superin tendent for G. L. Tarlton Contractin Co. on construction of tunnel and cana on the Colorado-Big Thompson Projec under a $1,328,000 contract. The job i located about 8 mi. west of Lovelan Colo. Walker foremen are **Art Stiles "Lefty" Whyer** and **"Whitey" Ross. Ro Johnson** is the labor foreman and **Har old Eckies** is master mechanic. **Fay Mc Connel** is chief electrician.

* * *

On construction of the sewage treat ment plant at Denver, Colo., under $1,447,000 contract, **Kris Nielsen** is th project manager for Thomas Bates & Sons. **E. E. "Buck" Andersen** is the gen eral superintendent. **P. E. Wagner** is th carpenter foreman and **Harry Portis** i concrete foreman. **Bert Wilson** is pur chasing agent and job office manager.

* * *

**Edgar J. Garbarini** is general super intendent for Bechtel Corp. on construc tion of the Contra Costa Steam Plant a Antioch, Calif., for the Pacific Gas & Electric Co. Job superintendents ar **Henry B. Burkhammer** and **Earl E Nichols. Philip N. Fletcher** is the proj ect engineer. Other engineers on the jo are **A. Martin Akeyson, Spencer B. Lan** and **Clarence Vroman. Arthur E. Hal**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gives you
LONGER LIFE; because Preforming helps to keep WIRE ROPE free from internal stress, reduces twisting and turning in the groove — thus cutting down *both* internal and external wear.
EASIER HANDLING; because it is relaxed and more flexible. These features insure smoother spooling.
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CHICAGO 7
SAN FRANCISCO 7
HOUSTON 3
PORTLAND 9
DENVER 2
SEATTLE 4

is cement finisher foreman, **Maurice J. Keena** is electrician foreman, and **Dan Gomez** is concrete foreman. **Basil Harris** is steel foreman, **Willis J. Gould** is carpenter foreman, **Arthur O. Michelson** is labor foreman, and **Jack Sommerville** is master mechanic. **Charles R. Culler** is carpenter foreman, and **O. A. Foot** is in charge of structural steel.

* * *

**Fred L. Burrows** is general superintendent and **Al Kuebel** is job superintendent on the $8,300,000 general contract for construction of the North Point Sewage Treatment plant and facilities at San Francisco. The contract is held by the joint-venture firm of M. & K. Corp., Fred J. Early, Jr., Stolte, Inc., and Haas and Rothschild. Assistant superintendents include **F. Stevenson, O. T. Thelander** and **Oscar Koskella. Ed Kramer** is millwright superintendent. **Bill Hunter** is general labor foreman, and **William Burke** is concrete foreman. **Walter Broderick** is the job engineer, and **R. "Dick" Stockman** is mechanical engineer. **G. A. Guaspari** is utility superintendent, and **J. H. Gerdes** is cost engineer. **L. Petran** is timekeeper, **Gordon Dahlgren** is office manager, and **J. B. Davis** is in charge of bookkeeping. **Harry Tobey** is superintendent for Raymond Concrete Pile Co., subcontractors, and **N. S. Olin** is Raymond's job office manager. **Bob Trask** is superintendent for Eaton & Smith on the excavating work, and **Guy Slack** is the operating engineer.

* * *

**George T. Warren** is general superintendent and **Ivan "Red" Chumbley** is job superintendent for Johnson, Drake & Piper on construction of the $1,500,000 interchange at 42nd Ave. on the Eastshore Freeway in Oakland, Calif. **Leon "Pete" Peterson** is grade superintendent and **J. C. Sugden** is the job engineer. **A. B. "Cookie" Cook** is master mechanic, and **Al Johns** is job office manager. Carpenter foremen are **H. Jack Duncan, J. Ken Sexton** and **R. V. Waylett.**

* * *

**Tom Coull** is the superintendent for Ben Gerwick, Inc., of San Francisco, on construction of cooling water intakes and cofferdams for the steam plant at Moss Landing, Calif., for Pacific Gas & Electric Co. **Dick Vlack** is the job engineer and **Ted Ridley** is pile driver foreman. **Mal Burgess** is job office manager and **Pete Cantu** is timekeeper. Stone & Webster have the contract for the plant under construction and have **H. F. Cleary** as superintendent.

* * *

**L. V. Kingsley** is the superintendent for C. F. Braun Co. on construction of the $4,500,000 Black-Oil Cycling Plant for Western Gulf Oil Co. at Paloma, near Bakersfield, Calif. **Elwin Brook** is carpenter supervisor and **Bob Kepley** is general carpenter foreman. **John C. Jackson** is the job office manager and **Herman Bruner** is timekeeper foreman. **Jimmy Conte** is general labor foreman. **H. C. "Mickey" Friedrich** is pipe supervisor and **Jack O'Neill** is pipe fabrication shop supervisor. **W. A. Compton** and **Warren Mertz** are pipe fabricating foremen. **George A. "Slim" Orr** is rigger supervisor, and **W. G. Nichols** is electrician supervisor. **Jack Herrmann** is surveyor foreman. **R. E. Bluff** is foreman for the operating engineers. **W. A. Verrett** is engineer coordinator. **Paul Stillman** is inspector foreman, and **William Salzman** is warehouse foreman.

* * *

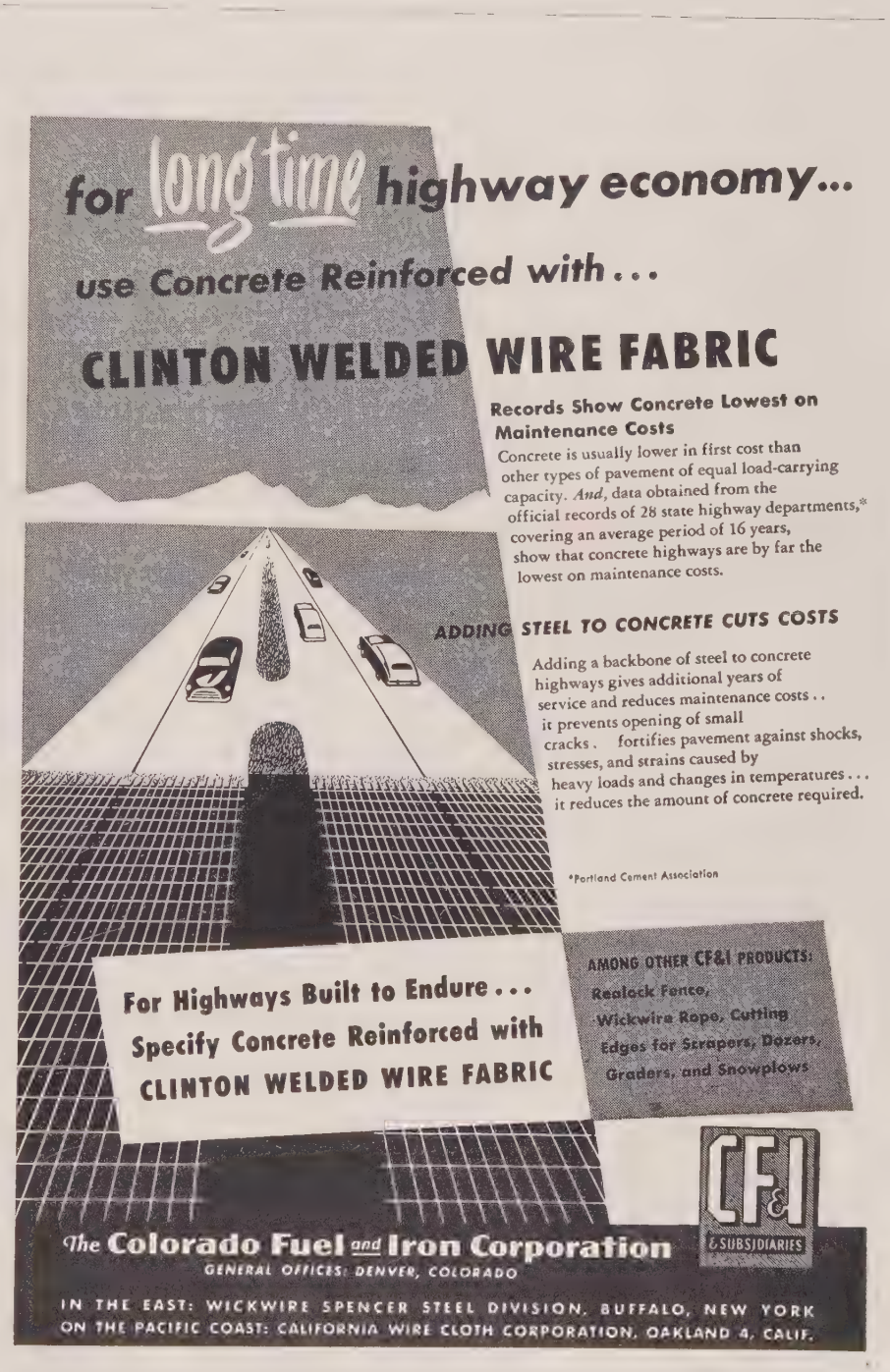
**John Alger** is superintendent for Brown Construction Co. on a $590,000 contract for construction on U. S. 40 from Empire to Berthoud Pass in Colorado. **G. H. "Hank" Eberhardt** is assistant superintendent. **Ollie Bertram** is carpenter foreman, **Roy Bailey** is grading foreman, **Dan Ratliff** is chief of shovel operations, **K. LaCasse** is paymaster, and **R. H. Elliott** is master mechanic.

* * *

**Floyd A. Baker** is project manager and **George Hayes** is superintendent for Hutcheson Construction Co. on a $250,000 contract for street improvements at Denver, Colo. **G. J. Estes** is master mechanic. Foremen are **Frank Eckholt** and **Ed Masters.**

* * *

**Roy Nowers** is the superintendent for Brown Construction Co. on construction of U. S. 40 near Arapahoe, Colo. Foremen on the $213,000 job are **Ollie Bertram, Roy Bailey, Joe Mansfield, Joe Miller** and **Robert Claphan. J. I. Firkins** is the master mechanic.



for long time highway economy...
use Concrete Reinforced with...
CLINTON WELDED WIRE FABRIC
Records Show Concrete Lowest on Maintenance Costs
Concrete is usually lower in first cost than other types of pavement of equal load-carrying capacity. And, data obtained from the official records of 28 state highway departments,* covering an average period of 16 years, show that concrete highways are by far the lowest on maintenance costs.
ADDING STEEL TO CONCRETE CUTS COSTS
Adding a backbone of steel to concrete highways gives additional years of service and reduces maintenance costs . . it prevents opening of small cracks . fortifies pavement against shocks, stresses, and strains caused by heavy loads and changes in temperatures . . . it reduces the amount of concrete required.
*Portland Cement Association
For Highways Built to Endure . . .
Specify Concrete Reinforced with
CLINTON WELDED WIRE FABRIC
AMONG OTHER CF&I PRODUCTS:
Reelock Fence,
Wickwire Rope, Cutting Edges for Scrapers, Dozers, Graders, and Snowplows
CF&I
The Colorado Fuel and Iron Corporation
& SUBSIDIARIES
GENERAL OFFICES: DENVER, COLORADO
IN THE EAST: WICKWIRE SPENCER STEEL DIVISION, BUFFALO, NEW YORK
ON THE PACIFIC COAST: CALIFORNIA WIRE CLOTH CORPORATION, OAKLAND 4, CALIF.

# Contracts . . .

## Summary of Major Construction Contracts Awarded Last Month

**United Concrete Pipe Corp.**, Box 425, Baldwin Park, Calif., was awarded a $4,246,464 contract by the City and County of San Francisco for construction of Sections A & C of a 34-mi. pipeline from Irvington Portal to Pulgas near Crystal Springs Lake, Calif. Schedule A will consist of placement of 78-in. reinforced concrete pipe, and Section C will be of 72-in. reinforced concrete pipe. **Artukovich Bros.**, 16200 S. Atlantic Ave., Paramount, Calif., and **Steve P. Rados**, 2975 San Fernando Road, Los Angeles, (joint venturers) were awarded a $4,097,546 contract for construction of Section B of the project, consisting of 72-in. lined and coated steel pipe.

**Morrison-Knudsen Co., Inc.**, 603 Hoge Bldg., Seattle, Wash., with a bid of $1,691,666, was awarded the contract by the Bureau of Reclamation for river-channel improvement work on the Columbia River below Grand Coulee Dam in Washington. Work will include resloping of the west river bank, quarrying of rock, and placing protective material on the slopes. The job will also include the placing of a large quantity of riprap and armor rock on the east bank.

**Peter Kiewit Sons' Co.**, 1024 Omaha National Bank Bldg., Omaha, Neb., and **Morrison-Knudsen Co., Inc.**, 319 Broadway, Boise, Ida., (joint venturers) were awarded a $5,740,400 contract by the Garrison District, Corps of Engineers, for excavation and main embankment work, Stage III, Garrison Dam and Reservoir near Riverdale, N. Dak. The site is on the Missouri River approximately 75 mi. northwest of Bismarck. The same joint venturers are currently completing Stage II of the project.

**Swinerton & Walberg Co.**, 225 Bush St., San Francisco, was awarded the $4,155,729 contract by the California Division of Architecture for construction of the 6-story reinforced concrete addition to the State Capitol Building at Sacramento.


**PRIMACORD-BICKFORD**
**Detonating Fuse**

**For safe, economical, efficient blasting**

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|---|
| One cap shoots unlimited charges |
| Simple to hook up—simple to check |
| No caps required in holes |
| Improves powder efficiency |
| Practically instantaneous |
| Always safe to handle |

The explosive wave travels 20,350 feet per second along the PETN core. Practically instantaneous, but the split-second time lag between holes gives relief of burden. A minimum of explosives gives maximum results.

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**COAST MANUFACTURING & SUPPLY CO.**

**Livermore, California**


**Guy F. Atkinson Co.**, 10 W. Orange Ave., South San Francisco; **Bressi & Bevanda Constructors, Inc.**, Box 439, North Hollywood, Calif.; **Charles L. Harney, Inc.**, 575 Berry St., San Francisco; **J. A. Jones Construction Co.**, 209 West Fourth St., Charlotte, North Carolina, and **A. Teichert & Son, Inc.**, Box 1113, Sacramento (joint venturers) were awarded a $24,339,776 contract by the Sacramento District, Corps of Engineers, for construction of the Pine Flat Dam Project on the Kings River 27 mi. east of Fresno, Calif. For details of the contract see *Western Construction News*, Nov. 15, 1949, page 101. A total of 1700 calendar days are allowed for completion.

**Morrison-Knudsen Co., Inc.**, 810 Title Bldg., Los Angeles, and **M. H. Hasler**, Box 387, Santa Ana, Calif., with a bid of $2,173,890, were awarded the contract by the Bureau of Reclamation for construction of earthwork, concrete lining and structures of the Delta-Mendota Canal near Dos Palos, Calif. 570 days are allowed for completion.

**Bechtel Corp.**, 3780 Wilshire Blvd., Los Angeles, have started construction of a manufacturing plant for Lever Bros. in East Los Angeles. The plant, estimated to cost more than $20,000,000, will consist of multi-storied reinforced concrete buildings and will be devoted to the complete processing of soap, non-soap detergents and edible products.

**Charles MacClosky Co.**, 628 Heliotrope Drive, Los Angeles; **R. E. Hazard Co.**, 2548 Kettner Blvd., San Diego, and **C. G. Willis & Sons**, 2119 E. 25th St., Los Angeles (joint venturers), were awarded a $1,284,270 contract by the California Division of Highways for construction of eight highway bridges and about 2.6 mi. of approaches between H Street and Chula Vista and 14th St., in National City, Calif. (San Diego County).

**Guy F. Atkinson Co.**, 806 Cascade Bldg., Portland, Ore., with a bid of $937,602, was awarded a contract by the Bureau of Reclamation for construction of the first 9 mi. of the Potholes East Canal of the Columbia Basin Project. The portion of canal covered by the contract begins at the Potholes Reservoir, near the center of the project in Eastern Washington. Work on the 9-mi. section will be chiefly excavation.

**Bechtel Corp.**, 220 Montgomery St., San Francisco, has been selected by the Atomic Energy Commission Idaho Operations Office at Idaho Falls, Ida., to perform major construction work on the first reactor to be built at the Commission's new Nuclear Reactor Testing Station near Arco, Ida. The structural steel and brick and concrete structure, to cost about $2,500,000, will be an experimental breeder reactor designed to test the feasibility of transmuting non-fissionable uranium into fissionable plutonium. Work on the plant is beginning immediately, and is expected to be completed by the end of 1950.

**Eaton & Smith**, 715 Ocean Ave., San Francisco, was awarded a $888,193 contract by the California Division of Highways for highway improvements in Santa Clara County. The job consists of grading and plant-mix surfacing on cement treated base of about 3.3 mi.

**Guy F. Atkinson Co.**, 806 Cascade Bldg., Seattle, Wash., with a bid of $946,620, was awarded the contract by the Seattle District, Corps of Engineers, for construction of a 1,146-ft. steel bridge across the Columbia River below the Chief Joseph Dam site near Bridgeport, Wash. Completion date is June, 1951.

**Fredericksen & Kasler**, 212 - 13th St., Sacramento, Calif., was awarded a $1,143,443 contract by the California Division of Highways for the grading and plant-mix surfacing of about 9.6 mi. of highway in San Bernardino and Riverside Counties, near Redlands.

**Guy F. Atkinson Co.**, Box 259, Long Beach, Calif., with a bid of $634,500, was awarded a contract by the Long Beach Harbor Department for construction of bulkheads and fill at Pier D, Berths 27-31 at Long Beach Harbor.

**Stolte, Inc.**, and **Duncanson-Harrelson Co.**, 8451 San Leandro St., Oakland, Calif., and **United Concrete Pipe Corp.** and **Ralph A. Bell**, Box 425, Baldwin Park, Calif., (joint venturers) were awarded a $978,720 contract for construction of the Tracy Switchyard on the Central Valley Project, 9 mi. northwest of Tracy.

**Sound Construction & Engineering Co.**, 1300 Aloha St., Seattle, Wash., with a bid of $1,599,931, was awarded the contract by the Oregon State Highway Commission for construction of the new state highway department office building at Salem, Ore.

**Steve P. Rados**, 2975 San Fernando Rd., Los Angeles, with a bid of $334,760, was awarded the contract by the Long Beach Water Department for the installation of 36-in. water main (prestressed pipe) in Long Beach.

**Earl W. Baker & Co.**, Bethany, Neb., with a bid of $310,000, was awarded a contract for construction of sanitary sewer sub-mains in Oklahoma City.

**M & K Corp., Fredrickson and Watson Construction Co.,** and **Piombo Construction Co.,** 873 - 81st Ave., Oakland (joint venturers) were awarded a $1,381,530 contract by the San Francisco Department of Public Works for construction of the Lake Merced sewer tunnel, Section 8.

**Oberg Brothers Construction Co.,** 401 W. Florence Ave., Inglewood, Calif., with a bid of $422,503, was awarded a contract by the California Division of Highways for construction of two reinforced concrete bridge undercrossings on the Harbor Freeway at First St. and Second St. in Los Angeles.

**Oklahoma Contracting Co.,** Merchants Bank Bldg., Dallas, Texas, and **Grafe-Callahan Construction Co.,** 714 W. Olympic, Los Angeles (joint venturers) were awarded a contract at approximately $6,000,000 for construction of the Boise, Ida., to Pasco, Wash., section of a steel petroleum pipeline for the Salt Lake Pipeline Co.

**Northwestern Engineering Co.,** Box 1392, Rapid City, and **Stanley H. Arkwright, Inc.,** Rapid City, S. Dak., (joint venturers) were awarded a $384,724 contract by the Montana State Highway Commission for the gravel surfacing and plant-mix oiling of about 23 mi. of the Ekalala-Baker Road in Carter and Fallon Counties.

**D. D. Skousen,** 207 Springer Bldg., Albuquerque, N. Mex., with a bid of $239,414, was awarded a contract by the New Mexico Highway Dept. for grading and bituminous surfacing of approximately 20 mi. of New Mexico Route 330 between Elida and Floyd. **Wylie Bros.,** 1711 E. Coal Ave., Albuquerque, was awarded a $377,594 contract for grading and bituminous surfacing of approx. 15 mi. of U. S. Highway 62-180 between Carlsbad and Hobbs. **Wylie Bros.** was also awarded a $321,717 contract for similar work on approx. 15 mi. U. S. 62 between Hobbs and Jal. **Skousen-Hise Contracting Co.,** Albuquerque, was awarded a $262,134 contract for similar work on 8 mi. of the highway between Carlsbad and White City.

**J. F. England Construction Co.,** Rapid City, S. Dak., was awarded a $247,945 contract by the Wyoming State Highway Department for grading and selected material surfacing of approx. 8 mi. of highway from Newcastle to Lusk Road in Weston County. The job includes 7 reinforced concrete culverts.

**R. H. Martin,** Box 934, Tucson, Ariz., with a bid of $323,609, was awarded a contract by Sanitary District No. 1, Pima County, for construction of the Prince Road Interceptor Sewer, a 9-mi. line extending to the Tucson outfall sewer.

**Miller & Strong, Inc.,** 3871 Royal Rd., Eugene, Ore., was awarded a $289,732 contract by the Bureau of Public Roads for clearing and grading a section of the Lewis & Clark highway about 17 mi. west of the Montana-Idaho state line.

**Basich Brothers Construction Co.,** 3850 S. San Gabriel Blvd., San Gabriel, Calif., and **Basich Bros.,** same address, (joint venturers) were awarded a $410,818 contract by the California Division of Highways for the grading and plant-mix surfacing of approximately 4.3 mi. of Firestone Blvd. in Los Angeles County. The job includes the paving and widening of an existing reinforced concrete bridge over the San Gabriel River.

**W. W. Clyde & Co.,** Springville, Utah, with a bid of $462,907, was awarded a contract by the Utah State Road Commission for construction of the highway between Scipio and Levan.

**The Rubenstein Co.,** 2518 N. 7th St., Phoenix, Ariz., was awarded an approximately $5,000,000 contract for construction of a military housing project at Williams Air Force Base, Chandler, Ariz. The project will consist of 500 individual housing units, and will be completed in about 17 months.

**Cox Brothers Construction Co.,** Box 36, Stanton, Calif., with a bid of $397,807, was awarded a contract by the California Division of Highways for the plant-mix surfacing of about 6.5 mi. of the highway between the north city limits of San Diego and Miramar in San Diego County.

**Bushman Construction Co.,** Box 107, St. Joseph, Mo., with a bid of $600,568, was awarded the contract by the Bureau of Reclamation for construction of earthwork and structures for the Cambridge Canal on the Missouri Basin Project near Arapahoe, Neb.

The Bureau of Reclamation has awarded a $1,844,414 contract to **Bethlehem Pacific Coast Steel Corp.,** 20th and Illinois Sts., South San Francisco, for construction of the steel towers for the 239-kv. West Side transmission lines from Shasta Powerhouse to Tracy Powerhouse on the Central Valley Project in Shasta County.

**Nels Mortensen & Co., Inc.,** 1021 Westlake No., Seattle, Wash., was awarded an approximately $3,500,000 contract for construction of a 400-unit housing project at the Moses Lake Air Force Base, Wash.

Every advantage of elevated water storage is provided by Pittsburgh-Des Moines Elevated Steel Tanks—uniform pressures, ample supply, lower pumping costs, dependable fire protection—*plus* sound engineering, fine workmanship, expert erection, a responsible guarantee of satisfaction.

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SEATTLE . . . . 928 Lane Street
DES MOINES . 921 Tuttle Street
DALLAS . 1225 Praetorian Bldg.
CHICAGO, 1224 First National Bank Building

# TRADE WINDS

**News of Men Who Sell to the Construction West**

## Western Distributor News Round-up

The E. H. EDWARDS CO., manufacturer of wire rope has announced the appointment of the REPUBLIC SUPPLY CO. OF CALIFORNIA as a distributor. By this move, seventeen new outlets in the central and southern portions of California were acquired. Stocks will be carried in all Republic field stores as well as in the new $1,250,000 head office and warehouse in the industrial district of Los Angeles. The

SIGNING the Edwards-Republic agreement are, l. to r.: DALE RUSSELL, vice-president, Republic; WALLY RUSHING, Los Angeles District Manager, Edwards; JACK PIKE, president, Republic; ROY JOHNSON, general sales manager, Republic, and RUSS HENDRICK, general sales manager, Edwards.

Edwards firm, whose plant is in South San Francisco, is a constantly-growing manufacturer of quality wire rope designed for both general applications and to do specific jobs. The West Coast manufacturing firm now has branch offices in Seattle, Portland, Los Angeles, and the South San Francisco plant has been constantly modernized as new equipment and engineering techniques have been developed. Republic Supply Co. now represents more than 200 manufacturers and has stores in Avenal, Bakersfield, Cuyama, Emeryville, Fresno, Gardenia, Huntington Beach, Long Beach, Los Angeles, Newhall, San Jose, Santa Fe Springs, Santa Maria, Stockton, Taft, Ventura and Wilmington.

☆ ☆ ☆

**Art Bodenhamer** has joined the EDWARD F. HALE CO., distributors of construction machinery at Oakland, Calif., after dissolving his own company of McIntosh & Bodenhamer in Oakland. He was associated with R. G. LeTourneau for many years, working with LeTourneau dealers in Northern California, and also has had actual construction experience on various highway and bridge jobs. His headquarters will be at the Hale main office, 22015 Meekland Ave., Oakland.

☆ ☆ ☆

In a move designed to provide additional work and display space, as well as parking space for customers, ARIZONA CONTRACTORS SUPPLY, formerly located in the Heard Building, Phoenix, have moved to 1221 East Van Buren St., according to an announcement by **D. Ray Hovatter**, general manager.

The firm, now in its third year of successful operation, have recently enlarged their activities in instituting a policy of collaboration with contractors in the construction of completely furnished homes, usually suited to the buyer's taste. **George Hada** is the second partner in the firm, having general charge of the office as well as advertising and general relations.

☆ ☆ ☆

LIMA SHOVEL AND CRANE DIVISION OF LIMA-HAMILTON CORP., Lima, Ohio, announces the appointment of TULSA EQUIPMENT CO., INC., Tulsa, Okla., as their sales agent in the State of Oklahoma, with the exception of six eastern counties in the state.

☆ ☆ ☆

COAST EQUIPMENT CO., San Francisco construction, industrial and mining machinery distributor, has been appointed exclusive Northern California sales and service representative for the MUNICIPAL SUPPLY CO. of South Bend, Ind., manufacturers of "South Bend" street maintenance equipment. Units in the line will be serviced from the firm's offices at Redding, Sacramento, Fresno and San Francisco.

☆ ☆ ☆

SMITH

**William J. Smith** was recently appointed to the sales staff of the SACRAMENTO VALLEY TRACTOR CO., Sacramento, Calif. Smith is well known in the Sacramento Valley, having been with the Capitol Tractor & Equipment Co. for many years.

☆ ☆ ☆

C. H. GRANT CO., distributor of concrete, asphalt and rock plant equipment, has moved to new and spacious quarters at 1401 East Shore Highway, Berkeley, Calif.

☆ ☆ ☆

KING AND KRINGEL MACHINERY CORP., Denver, Colo., has been named as distributor of the fork lift trucks, straddle trucks, mobile cranes and their attachments manufactured by HYSTER CO., whose factories are located in Portland, Ore., and Peoria and Danville, Ill. The new Hyster distributorship is headed by **K. T. King**, president; **J. R. Kringel**, secretary-treasurer, and **James G. Doyle**, vice-president. Territory allocated to the firm includes all of Colorado, most of Wyoming and the western part of Nebraska.

☆ ☆ ☆

HENDRIE & BOLTHOFF CO., Denver, Colo., has been named dealer for Allis-Chalmers centrifugal pumps in all of Colorado and Wyoming, and in portions of New Mexico, Nebraska and South Dakota. **S. F. Smith** is in charge of product sales for the firm, which has been in business since 1861 and employs 35 salesmen.

☆ ☆ ☆

HUNTER

**C. J. Hunter**, who for the last 6 years has been general parts manager for Peterson Tractor & Equipment Co., Caterpillar dealer at San Francisco and San Leandro, Calif., has joined CRATER LAKE MACHINERY CO. as manager at Medford, Ore. Crater Lake Machinery is the newly-appointed Caterpillar distributor for Southern Oregon.

☆ ☆ ☆

CHICAGO PNEUMATIC TOOL CO., Los Angeles Branch, announces HUDSON-TUCKER, INC., 629 First St., San Diego, Calif., as their new distributor of construction equipment in San Diego and Imperial counties. The well-known Hudson-Tucker distributorship has been in business for many years under the guiding hand of **W. H. Hudson**, president. **Harry Tucker, Jack Hudson** and **E. Richardson** complete an experienced organization ready to serve its customers with a complete line of Chicago Pneumatic tools and compressed air equipment.

☆ ☆ ☆

**R. L. "Bob" Watts**, general manager of the LUBRIPLATE DIVISION of FISKE REFINING CO., was a recent visitor to San Francisco. He made a tour of the Pacific Coast states. While in San Francisco, he made his headquarters at Miller & Stern Supply Co., Lubriplate's Northern California distributors. Watts was accompanied by **H. E. Van Bersers**, Pacific Coast Sales Engineer for Lubriplate Division.

☆ ☆ ☆

New distributors for the Nordberg 4FS-1 Diesel Engine manufactured by NORDBERG MANUFACTURING CO., Milwaukee, Wis., include AL-PAC ENGINE & EQUIPMENT CO., Seattle, Wash.; H. G. McKINNEY & CO., Wilmington, Calif., and NORTHWEST DISTRIBUTORS, LTD., Vancouver, B. C.

## News of Manufacturers in the West

INDEPENDENT PNEUMATIC TOOL CO., Aurora, Ill., manufacturer of Thor power tools, announces the appointment of new managers at its sales and service branches in Denver and San Francisco. **Eugene C. O'Connell**, formerly service manager in the Los Angeles branch, is the new manager at San Francisco. **Clarence H. Gabriel**, formerly service manager in the company's Salt Lake branch, is the new manager at Denver.

☆ ☆ ☆

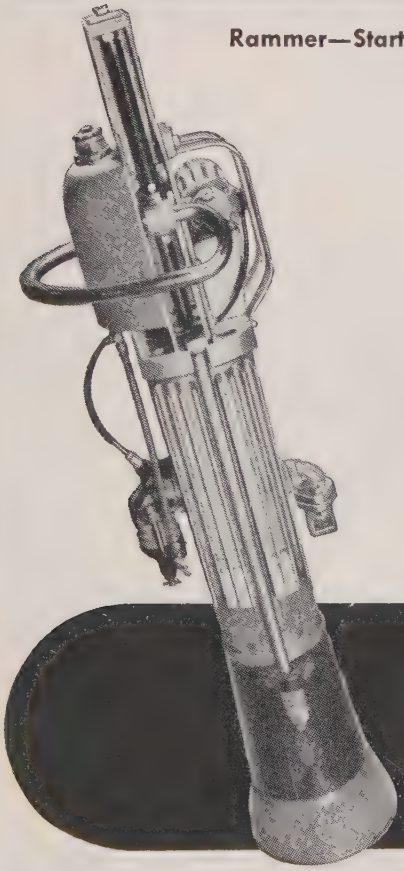
VICTOR EQUIPMENT CO., San Francisco, has purchased the business and assets of the Los Angeles manufacturing firm of MILLS ALLOYS, INC. The purchase includes the physical assests of Mills

# EASY, INEXPENSIVE SOIL COMPACTION

# *The New* BARCO RAMMER

Rammer—Starting

Rammer—Jumping



The new Barco Rammer is faster and more effective than any other type of tamper. It is easier on the worker, enables him to get more work done in less time, and at *lower cost.* Although rollers may do the compaction on large projects, they cannot reach locations close to abutments, culverts, walls and so on. But the new Barco Rammer remedies this situation, gives specified compaction. On large backfill tamping where a ditcher is used, the Barco Rammer works quickly and effectively. Today, with Federal, State and City authorities, as well as private corporations devoting more and more attention to these problems, the best answer is the Barco Rammer —the *entirely new* machine with the *entirely new method* of securing soil compaction. For more information write Barco Manufacturing Company, 1819 Winnemac Avenue, Chicago 40, Illinois. In Canada: The Holden Co., Ltd., Montreal, Canada.

**BARCO**

**GASOLINE RAMMER**

FREE ENTERPRISE—THE CORNERSTONE OF AMERICAN PROSPERITY

Alloys such as inventory, machines and equipment, the company's trade name, all patents, trademarks and formulas. Mills Alloys has been in business for more than 25 years and is a well-known manufacturer of all types of blasting nozzles and all types of tungsten carbide hard-surfacing rod. Victor is already laying plans to add the most modern rod-rolling and mill equipment to the seven electric furnaces acquired by the purchase.

☆ ☆ ☆

**Newton R. Crum,** for the past 4 years owner of WESTERN INDUSTRIAL SUPPLY CO. in Sacramento, Calif., is the new representative in California for the

# TRADE WINDS

Chicago firm, FLEXIBLE STEEL LACING CO., manufacturers of Alligator and Flexco belt fasteners for conveyor and transmission belts.

☆ ☆ ☆

The newly-formed BAER STEEL PRODUCTS, INC., of Auburn, Wash., has completed installation of extensive fabricating machinery in their new plant at Auburn and is working full time to fill a backlog of orders for dragline, dipper and hoe buckets and replaceable teeth. Co-owner and manager **Joe Baer** is well known for many excavating equipment improvements he developed while chief designing engineer with Esco and Bucyrus-Erie. The new Baer plant houses a complete pattern shop, steel fabricating shop and engineering department. The company is accepting orders for replaceable teeth for all makes of buckets and soliciting new inquiries for buckets of any size.

JOE BAER, left, co-owner-manager of Baer Steel Products, and DR. ALEXANDER FINLAYSON, metallurgist who helped develop new products

☆ ☆ ☆

A proposal by DRESSER INDUSTRIES, INC., Cleveland, Ohio, to purchase the common stock of the MAGNET COVE BARIUM CORP., of Houston, Texas, for approximately $2,800,000 in cash plus about 17,500 shares of Dresser common stock has been accepted by the majority stockholders of Magnet Cove. Magnet Cove's major products consist of mineral and chemical compounds used in the preparation of drilling "mud." Acquisition of the new product line will further Dresser's service to the oil and gas industries as makers of equipment and supplies for the production, transmission and processing of oil and gas.

☆ ☆ ☆

**Raymond M. Alvord,** commercial vice-president of the GENERAL ELECTRIC COMPANY's Pacific District from 1937 until 1947, died recently after a short illness at his home in San Francisco.

☆ ☆ ☆

QUINN

Changes in personnel of the FRUEHAUF TRAILER COMPANY's organization are announced by **L. A. Bearder,** Sales Manager of the Western Division. **Walter P. Quinn** has been appointed manager of the factory branch at Spokane and regional manager in charge of the Billings branch. **John Rogers,** who formerly was identified with the Fruehauf dealership in Hawaii, has been appointed service superintendent at Spokane, and **John Bianca** heads the parts department.

☆ ☆ ☆

The 29th warehouse in the storage and merchandising program of the UNITED STATES PLYWOOD CORP. was opened recently in Spokane, Wash. The building contains 6,000 sq. ft. of floor space and 400 sq. ft. for business and sales offices. **J. A. Staley,** Spokane warehouse manager, said, "Our warehouse construction has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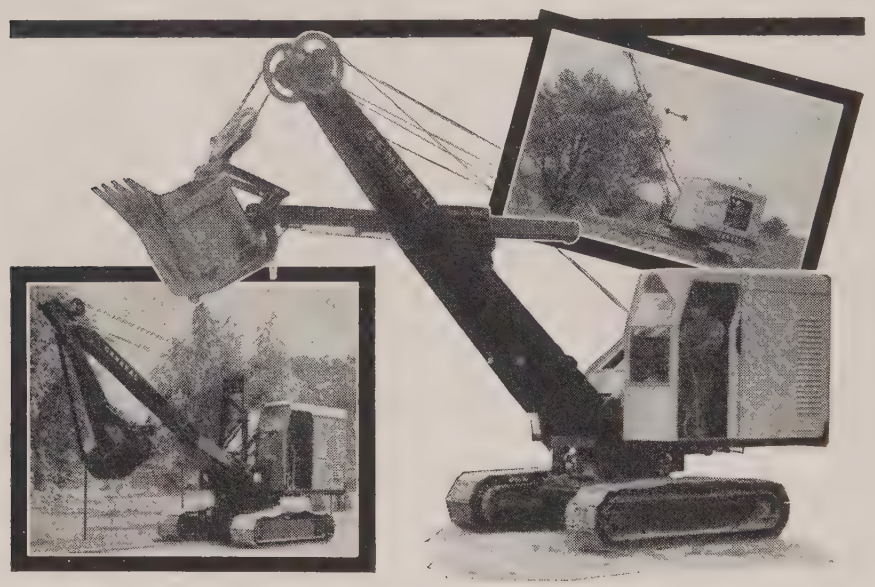
...AND STILL A LEADER!



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A typical General achievement is the self-propelled one-man, one-engine crane, on rubber. Similarly, the new General crawler-mounted shovels, cranes and draglines, etc., are making an enviable record of out-performing all other types of equipment of comparable rating. Write today for the latest details.

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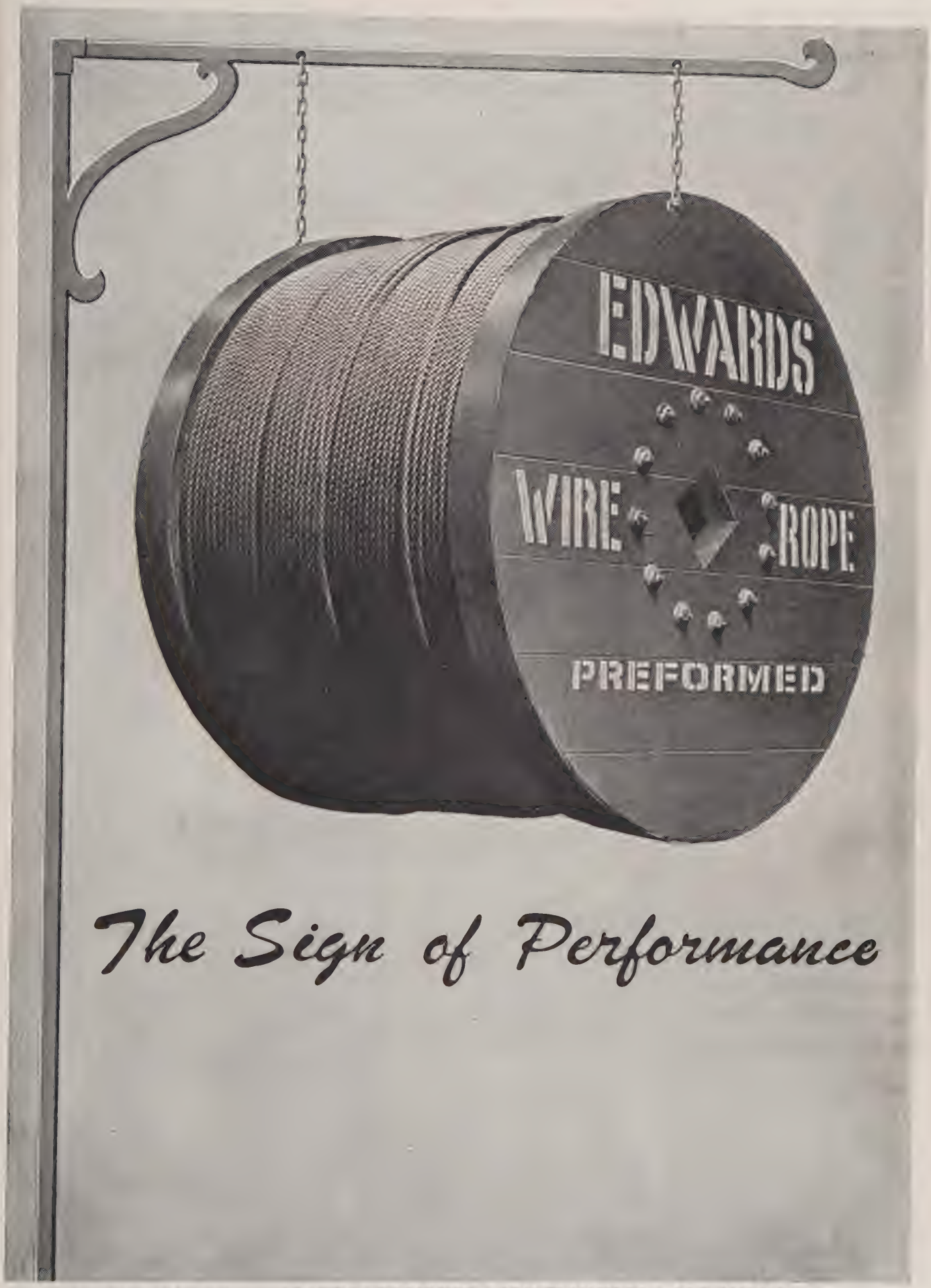
General Machinery Co., Spokane, Washington
Power Equipment Co., Denver, Colorado
Wood Tractor Co., Portland, Oregon
Electric Tool & Supply Co., Los Angeles, Calif.
Hilton's, Inc., Las Vegas, New Mexico
Lund Machinery Co., Salt Lake City, Utah
Seitz Machinery Co., Billings, Montana

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# TRADE WINDS

done away with many traditional structural members, resulting in increased available storage area." Modern mechanized equipment and material handling methods have made more efficient reception, storage, and shipping of all the company's products.

☆ ☆ ☆

DELLEN

**Everett C. Dellen,** formerly district manager in the Atlanta territory, now represents the EUCLID ROAD MACHINERY CO. in Arizona, New Mexico, Colorado and southern Wyoming. He has been with Euclid since 1935 as a sales and service representative. He succeeds **T. J. Hawthorne,** who has resigned.

☆ ☆ ☆

STANDARD OIL CO. OF CALIFORNIA launched a new series of Diesel and heavy-duty gasoline engine lubricants recently after two weeks of intensive indoctrination which brought 400 members of its marketing staffs together for meetings in San Francisco, Los Angeles and Seattle.

☆ ☆ ☆

**Hyrum Petersen,** retired sales representative and explosives expert with HERCULES POWDER CO., Salt Lake City branch, died recently.

☆ ☆ ☆

The appointment of **James G. Goodenough** as assistant chairman of the Department of Applied Mechanics at STANFORD RESEARCH INSTITUTE, Stanford, Calif., has been announced by **Dr. J. E. Hobson,** Director.

☆ ☆ ☆

**Earl B. Maloon,** manager of the construction equipment division of SOUTHWEST WELDING & MANUFACTURING CO., Alhambra, Calif., has announced the appointment of **Harry D. Kadz** as assistant manager of that division. Kadz, widely-known in the Western construction industry, was formerly general manager of Kay-Brunner Steel Products, Inc.

☆ ☆ ☆

## Manufacturing News From the East and Midwest Regions

**W. J. Corr** has been named to the newly-created post of director of service for MACK TRUCKS, INC. He will make his headquarters at Mack's headquarters plant at Plainfield, N. J. With Mack for a quarter of a century, Corr has served as service manager for its branches at Akron, Cincinnati and Chicago.

☆ ☆ ☆

THE MANDT MANUFACTURING CO. has been incorporated at Columbus, Ohio, to manufacture and market the Mandt Swing Loader, a hydraulically-operated material loader with 180-deg. swing

*Continued on page 104*

# UNIT BID SUMMARY

## Water Supply . . .

### California—Alameda County—District—Steel Water Mains

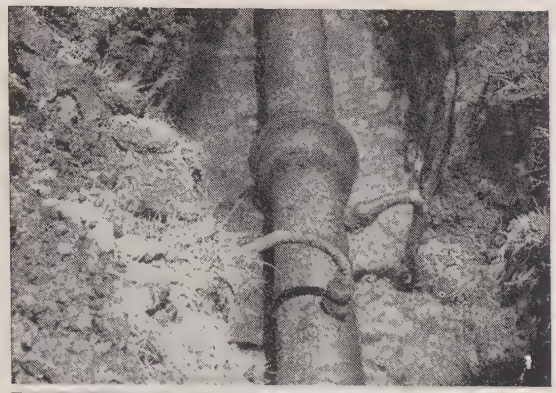
United Concrete Pipe Corp., Baldwin Park, Calif., with a bid of $258,086, was low before the East Ba Municipal Utility District at Oakland, Calif., for furnishing and installing approximately 4,660 lin. ft. 54- and 60-in. welded steel water main in tunnels, approximately 6,000 lin. ft. of 48-in. welded steel wat main in trench, and approximately 3,140 lin. ft. of 4- to 16-in. cast iron water main in trench. Unit bids wer submitted as follows:

| | | | |
|---|---|---|---|
| (A) | United Concrete Pipe Corp. | $258,086 | |
| (B) | McGuire & Hester | 327,949 | |
| (C) | Underground Construction Co. | 342,438 | |
| (D) | Erickson, Phillips & Weisberg | 363,344 | |
| (E) | P & J Artukovich | 366,416 | |
| (F) | E. T. Haas Co. | $377,93 | |
| (G) | Artukovich Bros., Inc., and Steve P. Rados | 392,97 | |
| (H) | Stanley H. Koller | 395,15 | |

(1) 18,000 cu. yd. earth excav. for trench for steel pipe.
(2) 550 cu. yd. earth excav. for trench for cast iron pipe
(3) 2,000 cu. yd. rock excav. in trench
(4) 100 cu. yd. excav. outside trench
(6) 450 cu. yd. unclassified excav. for structs.
(7) 14,700 cu. yd. backfill or trench for steel pipe
(8) 200 lin. ft. for trench sheeting left in place
(9) 880 lin. ft. excav. tunnel, install 60-in. ID welded steel pipe and place conc. backfill
(10) 3,780 lin. ft. 54-in. ID welded steel pipe—trench
(11) 6,000 lin. ft. 48-in. ID welded steel pipe—trench
(12) 60 lin. ft. 36-in. ID welded steel pipe—trench
(13) 60 lin. ft. 30-in. ID welded steel pipe—trench
(14) 30 lin. ft. 24-in. ID welded steel pipe—trench
(15) 330 lin. ft. install 16-in. cast iron pipe
(16) 150 lin. ft. install 8-in. cast iron pipe
(17) 2,600 lin. ft. install 6-in. cast iron pipe
(18) 60 lin ft. install 4-in. cast iron pipe
(19) 30 ea. construct B & S joints in 60-in. pipe
(20) 125 ea. const. B & S joints in 54-in. pipe
(21) 200 ea. const. B & S joints in 48-in. pipe
(22) 2 ea. const. B & S joints in 36-in. pipe
(23) 3 ea. const. B & S joints in 30-in. pipe
(24) 2 ea. const. B & S joints in 24-in. pipe
(25) 4 ea. const. butt strap joints in 60-in. pipe
(26) 40 ea. const. butt strap joints in 54-in. pipe
(27) 46 ea. const. butt strap joints in 48-in. pipe
(28) 2 ea. const. butt strap joints in 42-in. pipe
(29) 10 ea. const. butt strap joints in 36-in. pipe
(30) 6 ea. const. butt strap joints in 30-in. pipe
(31) 2 ea. const. butt strap joints in 24-in. pipe
(32) 2 ea. circumferential cups in 60-in. pipe
(33) 30 ea. circumferential cups in 54-in. pipe
(34) 40 ea. circumferential cups in 48-in. pipe
(35) 2 ea. circumferential cups in 42-in. pipe
(36) 6 ea. circumferential cups in 36-in. pipe
(37) 4 ea. circumferential cups in 30-in. pipe
(38) 2 ea. circumferential cups in 24-in. pipe
(40) 35 cu. yd. furn. and install conc. in anchors
(41) 110 cu. yd. furn. and install conc. in structs.
(42) 720 bbl. furn. Portland cement
(43) 11,000 lb. furn. and install reinf. bars
(44) 1 only install 42-in. gate valve
(45) 3 ea. install 36-in. gate valve
(46) 2 ea. install 30-in. gate valve
(47) 1 only install 24-in. gate valve
(48) 1 only install 16-in. gate valve
(49) 2 each install 8-in. gate valve
(50) 4 each install 6-in. gate valve
(51) 2 each install 4-in. gate valve
(52) 9 ea. install 4-in. air valves
(53) 1 only install 2-in. air valves
(54) 1 only furn., install and remove 6-in. temp blow-off
(55) 1 only furn. and install 6-in. blow-off an pumping tee—street type
(56) 6 each furn. and install 6-in. blow-off an pumping tee—curb type
(57) 1 only furn. and install 2-in. blow-off
(58) 1 only remove 1- or 2-in. blow-off, class A
(59) 3 ea. remove and reset fire hydrants
(60) 3,000 lb. install cast iron fittings
(61) 5 ea. furn. and install ¾-in. main cocks
(62) 300 lin. ft. furn. and install ¾-in. copper ser pipe
(63) 30 ea. transfer ¾-in. copper service lines
(64) 200 lin. ft. remove 8-in. cast iron pipe
(65) 1,360 lin. ft. remove 6-in. cast iron pipe
(66) 200 lin. ft. remove 4-in. cast iron pipe
(67) 2 ea. remove 8-in. gate valves
(68) 5 ea. remove 6-in. gate valves
(69) 2 ea. remove 4-in. gate valves
(70) 17 ea. install manhole on pipe
(71) 1 only install 54x30-in. saddle nozzle
(72) 1 only install 42x30-in. saddle nozzle
(73) 1 only install 30x16-in. saddle nozzle
(74) 2 ea. install 54-in. bumped head
(75) 1 only install 36-in. bumped head
(76) 2 ea. install 30-in. blind flanges
(77) 2 ea. install 54-in. dresser couplings
(78) 1 only install 42-in. dresser couplings
(79) 3 ea. install 36-in. dresser couplings
(80) 3 ea. install 30-in. dresser couplings
(81) 4,000 lb. install miscl. metal in structs.
(82) 1 only furn. and install brick support for ma holes
(83) install equipment in structs. at sta. 8 plus 8
(84) 1 only install equip. in structs. at sta. 8 plu 00
(85) 1 only install equip. in structs. at sta. 511 plu 00
(86) 100 lin. ft. furn. and install 4-in. soil pipe
(88) 100 cu. yd. selected backfill from trench
(89) 200 cu. yd. furn. imported backfill
(90) 200 cu. yd. furn. quarry waste backfill
(91) 50 sq. yd. repair pavement, class A
(92) 5,800 sq. yd. repair pavement, class B
(93) 15 sq. yd. repair sidewalks
(94) 2 ea. furn. and install marker posts
(95) 20 ea. mark curbs

| | (A) | (B) | (C) | (D) | (E) | (F) | (G) | (H) |
|---|---|---|---|---|---|---|---|---|
| (1) | 3.00 | 3.80 | 4.20 | 4.00 | 5.00 | 3.00 | 2.00 | 3.7 |
| (2) | 5.00 | 8.75 | 4.20 | 8.10 | 7.00 | 7.00 | 3.00 | 4.0 |
| (3) | 3.00 | 6.25 | 5.00 | 4.00 | 6.00 | 10.00 | 15.00 | 10.0 |
| (4) | 3.00 | 6.25 | 5.00 | 8.70 | 12.00 | 10.00 | 5.00 | 10.0 |
| (6) | 5.00 | 8.10 | 8.10 | 5.20 | 8.00 | 8.00 | 5.00 | 5.0 |
| (7) | 1.50 | 1.10 | 1.55 | 1.83 | 1.00 | 2.00 | .50 | 3.5 |
| (8) | 10.00 | .90 | 4.75 | 7.20 | 6.00 | 2.00 | 3.00 | 4.0 |
| (9) | 110.00 | 100.00 | 103.80 | 123.00 | 110.00 | 140.00 | 150.00 | 132.0 |
| (10) | 1.00 | 3.25 | 3.75 | 3.50 | 3.00 | 5.00 | 9.00 | 2.8 |
| (11) | 1.00 | 3.10 | 3.20 | 3.10 | 2.90 | 3.00 | 7.00 | 2.7 |
| (12) | 5.00 | 3.50 | 2.70 | 3.91 | 2.80 | 3.00 | 6.00 | 6.0 |
| (13) | 5.00 | 3.50 | 2.70 | 2.91 | 2.75 | 2.00 | 6.00 | 6.0 |
| (14) | 5.00 | 3.50 | 2.70 | 2.30 | 2.70 | 2.00 | 5.00 | 7.0 |
| (15) | 1.00 | 1.70 | 1.90 | 3.10 | 2.50 | 3.50 | 5.00 | 8.0 |
| (16) | 1.00 | 1.15 | 1.10 | 2.55 | 2.00 | 2.00 | 1.50 | 4.0 |
| (17) | 1.00 | .65 | .85 | 2.40 | 1.80 | 1.00 | 1.50 | 2.0 |
| (18) | .60 | .60 | .85 | 2.20 | 1.70 | 1.00 | 1.00 | 4.0 |
| (19) | 100.00 | 75.00 | 55.00 | 70.00 | 110.00 | 120.00 | 200.00 | 58.0 |
| (20) | 70.00 | 87.50 | 85.25 | 109.00 | 85.00 | 75.00 | 90.00 | 78.0 |
| (21) | 70.00 | 85.00 | 75.70 | 84.00 | 80.00 | 70.00 | 80.00 | 70.0 |
| (22) | 60.00 | 62.50 | 64.00 | 74.00 | 70.00 | 65.00 | 70.00 | 65.0 |
| (23) | 60.00 | 62.60 | 60.00 | 68.00 | 68.00 | 60.00 | 70.00 | 55.0 |
| (24) | 60.00 | 50.00 | 50.00 | 62.00 | 65.00 | 45.00 | 50.00 | 45.0 |
| (25) | 120.00 | 250.00 | 132.00 | 149.00 | 210.00 | 200.00 | 200.00 | 120.0 |
| (26) | 110.00 | 220.00 | 132.00 | 167.00 | 175.00 | 125.00 | 175.00 | 110.0 |
| (27) | 100.00 | 200.00 | 128.00 | 138.00 | 170.00 | 120.00 | 150.00 | 95.0 |
| (28) | 80.00 | 190.00 | 120.00 | 125.00 | 160.00 | 115.00 | 140.00 | 85.0 |
| (29) | 70.00 | 155.00 | 98.00 | 120.00 | 140.00 | 110.00 | 120.00 | 75.0 |
| (30) | 60.00 | 155.00 | 94.00 | 104.00 | 135.00 | 110.00 | 110.00 | 65.0 |
| (31) | 70.00 | 125.00 | 81.00 | 90.00 | 125.00 | 95.00 | 100.00 | 60.0 |
| (32) | 30.00 | 37.50 | 20.00 | 23.00 | 40.00 | 25.00 | 40.00 | 15.0 |
| (33) | 30.00 | 37.50 | 20.00 | 21.00 | 35.00 | 23.00 | 35.00 | 13.5 |
| (34) | 30.00 | 37.50 | 19.00 | 18.00 | 30.00 | 21.00 | 30.00 | 12.0 |
| (35) | 30.00 | 37.50 | 16.00 | 16.00 | 30.00 | 20.00 | 25.00 | 10.0 |
| (36) | 30.00 | 32.00 | 15.00 | 13.00 | 28.00 | 18.00 | 25.00 | 10.0 |
| (37) | 30.00 | 32.00 | 14.00 | 11.00 | 25.00 | 16.00 | 25.00 | 8.0 |

*(Continued on next page)*



# Going strong in their 2nd Century

About 30 of the older American cities have cast iron water or gas mains in service which were laid from 100 to 132 years ago. Most of these mains, on or after their 100th Anniversary, have been uncovered, inspected and photographed for the record. Five of them—all water mains, are shown in this advertisement.

While it is well known that cast iron water mains in England, France and Germany have service records that approach three centuries, we, who make cast iron pipe, nevertheless get a thrill out of looking down into the trench at an uncovered section of a main that has been in service for 100 years—and so, we are told, do water works and gas engineers.

When one considers the radical changes which have occurred in a century in vehicular traffic, and the vast development of underground construction for the many utility services, the fact that these mains are now in their second century of service is all the more remarkable.

**(1)** This 101-year-old cast iron water main is serving Frederick, Maryland.

**(2)** Still in use after 118 years of service in the water supply system of St. Louis, Mo.

**(3)** This water main, installed 117 years ago, is still serving Richmond, Va.

**(4)** Lancaster, Pa. laid this cast iron water main 105 years ago. It is still serving.

**(5)** One of several cast iron water mains that have been serving New York City for more than a century.

**96%** OF ALL 6-INCH AND LARGER CAST IRON WATER MAINS EVER LAID IN 25 REPRESENTATIVE CITIES ARE STILL IN SERVICE.

Based on the findings of a survey conducted by leading water works engineers.

Cast Iron Pipe Research Assn., T. F. Wolfe, Engr., Peoples Gas Bldg., Chicago 3.

**CAST IRON PIPE**

SERVES FOR CENTURIES

# TRADE WINDS

*Continued from page 102*

which can also be quickly converted by attachments to either a mobile crane or backhoe. **O. G. Mandt,** recently-retired president of the Jaeger Machine Co., heads the new company.

☆ ☆ ☆

A. LESCHEN & SONS ROPE CO., St. Louis, Mo., announce the election of **Arthur A. Leschen** as president and **Douglas W. Vernon** as vice-president and general manager. Leschen came with the company in 1902 after having attended Wash-

LESCHEN

VERNON

ington University. He is a grandson of **Adolph Leschen** who founded the company in 1857. Since 1943, he has served as vice-president in charge of production.

He succeeds the late **William C. Henning,** who was president from 1943 until his recent death. Vernon became associated with the company in 1945 as general manager of sales. In 1947 he was elected vice-president in charge of sales. In addition to his duties as general manager, he will continue to direct the activities of the sales department.

☆ ☆ ☆

NORVIG

The appointment of **Otto V. Norvig** as sales engineer of the Crusher and Process Machinery Divisions was announced by the NORDBERG MANUFACTURING CO., Milwaukee, Wisc. Norvig will assist **J. B. Bond,** District Manager, Milwaukee office, and will specialize in the cement and non-metallic minerals fields.

☆ ☆ ☆

**Mark Gardner** has succeeded **Oscar M. Havekotte,** resigned, as president of the INTERNATIONAL DERRICK & EQUIPMENT CO., Cleveland, Ohio. Gardner will make his headquarters in Dallas, Texas, where the company's headquarters are being moved.

☆ ☆ ☆

MARTIN MACHINE CO., Kewanee, Ill., announces the appointment of **James M. Arroyo** to the position of company sales manager. Arroyo became associated with the Martin sales department several months ago to head export sales. Martin Machine manufactures heavy-duty gooseneck trailers for the construction industry.

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| (38) | 30.00 | 32.00 | 12.00 | 8.00 | 23.00 | 14.00 | 25.00 | 6.00 |
| (40) | 60.00 | 20.00 | 29.00 | 54.00 | 30.00 | 30.00 | 35.00 | 40.00 |
| (41) | 120.00 | 75.00 | 78.00 | 65.00 | 75.00 | 50.00 | 60.00 | 75.00 |
| (42) | 6.00 | 4.40 | 4.10 | 3.40 | 4.50 | 5.00 | 4.00 | 4.2 |
| (43) | .20 | .20 | .14 | .16 | .12 | .15 | .12 | .1 |
| (44) | 600.00 | 265.00 | 381.00 | 215.00 | 125.00 | 300.00 | 250.00 | 285.00 |
| (45) | 500.00 | 250.00 | 272.00 | 195.00 | 110.00 | 250.00 | 225.00 | 245.00 |
| (46) | 400.00 | 220.00 | 218.00 | 172.00 | 100.00 | 200.00 | 225.00 | 200.00 |
| (47) | 200.00 | 210.00 | 177.00 | 154.00 | 90.00 | 190.00 | 200.00 | 150.00 |
| (48) | 100.00 | 125.00 | 112.00 | 114.00 | 80.00 | 170.00 | 100.00 | 90.00 |
| (49) | 60.00 | 50.00 | 30.00 | 64.00 | 50.00 | 35.00 | 75.00 | 30.00 |
| (50) | 50.00 | 37.50 | 25.00 | 50.00 | 35.00 | 30.00 | 75.00 | 14.00 |
| (51) | 30.00 | 32.00 | 15.00 | 45.00 | 30.00 | 25.00 | 65.00 | 10.00 |
| (52) | 30.00 | 125.00 | 81.00 | 254.00 | 35.00 | 100.00 | 120.00 | 200.00 |
| (53) | 20.00 | 125.00 | 41.00 | 75.00 | 30.00 | 50.00 | 90.00 | 100.00 |
| (54) | 200.00 | 60.00 | 198.00 | 95.00 | 500.00 | 200.00 | 500.00 | 300.00 |
| (55) | 200.00 | 125.00 | 170.00 | 117.00 | 250.00 | 300.00 | 500.00 | 200.00 |
| (56) | 200.00 | 125.00 | 184.00 | 160.00 | 200.00 | 400.00 | 500.00 | 300.00 |
| (57) | 100.00 | 90.00 | 41.00 | 50.00 | 150.00 | 70.00 | 350.00 | 50.00 |
| (58) | 100.00 | 25.00 | 20 00 | 28.00 | 30.00 | 50.00 | 150.00 | 30.00 |
| (59) | 100.00 | 60.00 | 70.00 | 90.00 | 60.00 | 200.00 | 100.00 | 100.00 |
| (60) | .10 | .10 | .32 | .17 | .20 | .12 | .25 | .1( |
| (61) | 20.00 | 6.25 | 7.40 | 14.00 | 15.00 | 10.00 | 10.00 | 10.00 |
| (62) | 1.00 | 2.40 | 2.00 | 2.30 | 1.40 | 1.30 | 2.00 | 2.00 |
| (63) | 1.00 | 6.25 | 20.40 | 26.00 | 12.00 | 25.00 | 25.00 | 10.00 |
| (64) | 1.00 | 1.45 | 2.70 | 4.25 | 2.00 | 1.00 | 2.50 | 8.00 |
| (65) | 1.00 | 1.45 | 2.60 | 3.00 | 1.90 | .90 | 2.00 | 4.00 |
| (66) | 1.00 | 1.45 | 2.25 | 3.00 | 1.80 | .80 | 2.00 | 3.00 |
| (67) | 30.00 | 30.00 | 8.00 | 24.00 | 40.00 | 10.00 | 50.00 | 15.00 |
| (68) | 30.00 | 30.00 | 7.00 | 24.00 | 35.00 | 10.00 | 40.00 | 10.00 |
| (69) | 30.00 | 30.00 | 5.00 | 18.00 | 30.00 | 10.00 | 40.00 | 10.00 |
| (70) | 60.00 | 70.00 | 70.00 | 58.00 | 100.00 | 70.00 | 100.00 | 45.00 |
| (71) | 100.00 | 190.00 | 230.00 | 135.00 | 200.00 | 200.00 | 100.00 | 85.00 |
| (72) | 100.00 | 185.00 | 195.00 | 135.00 | 190.00 | 200.00 | 100.00 | 70.00 |
| (73) | 100.00 | 125.00 | 159.00 | 104.00 | 180.00 | 200.00 | 90.00 | 60.00 |
| (74) | 300.00 | 125.00 | 155.00 | 143.00 | 80.00 | 150.00 | 75.00 | 60.00 |
| (75) | 300.00 | 95.00 | 110.00 | 117.00 | 60.00 | 100.00 | 50.00 | 50.00 |
| (76) | 200.00 | 31.00 | 34.00 | 70.00 | 50.00 | 100.00 | 50.00 | 30.00 |
| (77) | 300.00 | 125.00 | 190.00 | 66.00 | 50.00 | 100.00 | 50.00 | 50.00 |
| (78) | 100.00 | 95.00 | 150.00 | 52.00 | 40.00 | 90.00 | 50.00 | 45.00 |
| (79) | 100.00 | 95.00 | 109.00 | 52.00 | 35.00 | 80.00 | 40.00 | 45.00 |
| (80) | 100.00 | 90.00 | 109.00 | 45.00 | 30.00 | 100.00 | 40.00 | 30.00 |
| (81) | .10 | .12 | .27 | .24 | .125 | .30 | .50 | .25 |
| (82) | 300.00 | 95.00 | 57.00 | 180.00 | 200.00 | 100.00 | 150.00 | 50.00 |
| (83) | 500.00 | 625.00 | 463.00 | 202.00 | 500.00 | $2,000 | 500.00 | 800.00 |
| (84) | 300.00 | 500.00 | 923.00 | 385.00 | 450.00 | 900.00 | 500.00 | $1,000 |
| (85) | 200.00 | 375.00 | 558.00 | 360.00 | 425.00 | $1,000 | 500.00 | 600.00 |
| (86) | 1.00 | 2.20 | 2.45 | 2.90 | 2.00 | 3.00 | 3.00 | 5.00 |
| (88) | 3.00 | .15 | .14 | .60 | 2.00 | .50 | .25 | ..... |
| (89) | 3.00 | 1.00 | 2.30 | 1.80 | 2.50 | 3.00 | 3.00 | ..... |
| (90) | 5.00 | 1.70 | 2.30 | 1.60 | 2.50 | 3.00 | 3.00 | ..... |
| (91) | 5.00 | 5.60 | 5.50 | 9.00 | 6.00 | 6.50 | 6.00 | 4.50 |
| (92) | 1.50 | 2.50 | 3.70 | 2.70 | 4.50 | 4.50 | 2.00 | 4.00 |
| (93) | 4.00 | 4.40 | 5.20 | 4.50 | 8.00 | 6.00 | 4.00 | 4.00 |
| (94) | 10.00 | 12.50 | 12.00 | 12.00 | 10.00 | 13.00 | 15.00 | 10.00 |
| (95) | 5.00 | 6.25 | 6.80 | 6.80 | 10.00 | 10.00 | 8.00 | 5.00 |

# Dam . . .

## North Dakota—McLean and Mercer Counties—Corps of Engineers—Excav. and Embankment

Peter Kiewit Sons' Co. and Morrison-Knudsen Co., Inc., joint-venturers, with a bid of $5,740,500, were low before the Corps of Engineers at Bismarck, North Dakota, for channel and spillway area excavation and construction of main embankment at Garrison Dam on the Missouri River 75 mi. northwest of Bismarck. Completion time for this Stage 3 construction is May, 1952. The joint venturers are already established at the dam site for their work on Stage 2 of the construction. Unit bids were submitted as follows:

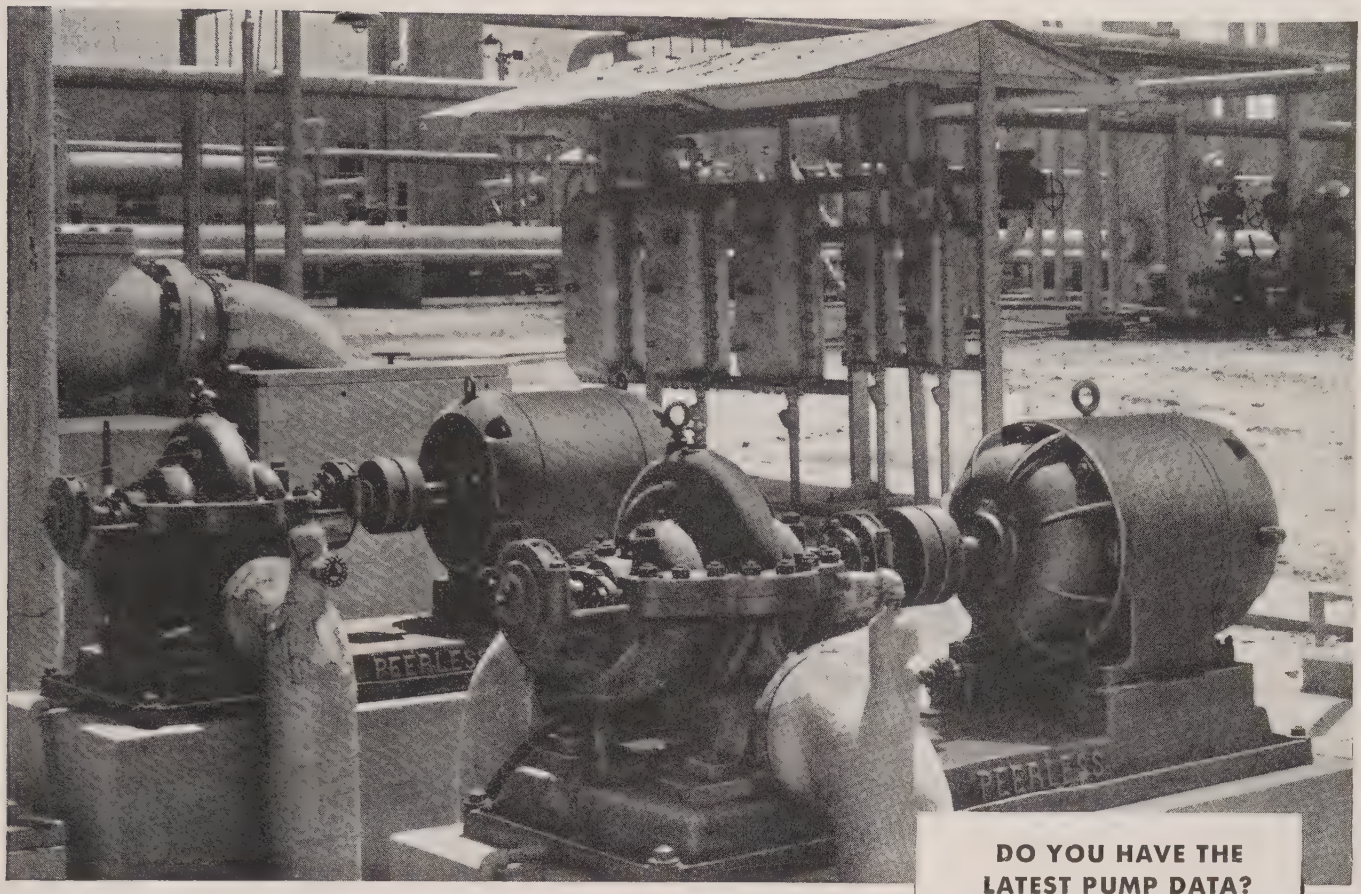
(A) Peter Kiewit Sons' Co. and Morrison-Knudsen Co., Inc. ..... $5,740,500
(B) Charles H. Tompkins & Associates 6,450,800
(C) Garrison Builders ..... 6,710,262
(D) Western Contracting Corp. ..... 6,865,886
(E) S. J. Groves & Sons ..... 7,489,552
(F) C. F. Lytle Co. and Amis Construction Co. ..... 7,892,748
(G) Wunderlich Contracting Corp. ..... $8,072,645
(H) Hooper Construction Co. and W. R. Aldrich ..... 8,218,995
(I) Grafe-Callahan Construction Co. and Gunther & Shirley Co. ..... 9,743,053
(J) Mittry Construction Co. ..... 9,928,235
(K) Government estimate ..... 5,434,180

(1) 14,000 cu. yd. excav., stripping
(2) 1,500,000 cu. yd. excav., intake channel
(3) 6,900,000 cu. yd. excav., outlet channel
(4) 1,200,000 cu. yd. excav., waste
(5) 120,000 cu. yd. excav., recovery from intake channel areas No. 3
(6) 1,500,000 cu. yd. excav., borrow area "A-9"
(7) 30,000 cu. yd. excav., trench
(8) 85,000 cu. yd. excav., miscl.
(9) 475,000 cu. yd. salvage lignite to west bank
(10) 50,000 cu. yd. salvage lignite to bank
(11) 7,250,000 cu. yd. dam embank., impervious and random
(12) 285,000 cu. yd. dam embank., pervious
(13) 100,000 cu. yd. embank., roadway
(14) 170,000 cu. yd. compact. imperv. blanket, type I
(15) 135,000 cu. yd. compact. imperv. blanket, type II
(16) 40,000 1,000-gal. tanks water for compaction
(17) 1,000,000 squares addtl. compact., 2 passes
(18) 3,200 lin. ft. trench for piezometers
(19) 8 type A piezometer
(20) 12 type L piezometer, tip and drive pipe
(21) 800 lin. ft. type L piezometer, foot of length in excess of tip and drive pipe
(22) 31,000 lin. ft. plastic tubing
(23) Lump sum, terminal well
(24) 4 comb. piezometer and settlement gage; type E, lower 14 ft. of length
(25) 850 lin. ft. comb. piezometer and settlement gage; type E, foot of length in excess of 14 ft.
(26) 300,000 tons unload rock and spalls
(27) 23,000 cu. yd. bank-run gravel for toe drain
(28) 1,700 lin. ft. perf. pipe drain, 12-in. diam.
(29) 940 lin. ft. perf. pipe drain, 15-in. diam.
(30) 360 lin. ft. perf. pipe drain 24-in. diam.
(31) 250 lin. ft. outfall drain, 30-in. diam.
(32) 7 manhole, 10-ft. depth
(33) 45 lin. ft. manhole, addtl. depth
(34) 140,000 sq. yd. place slope protect'n, type A
(35) 47,000 sq. yd. place slope protect'n, type B
(36) 9,200 cu. yd. gravel roadway surf.
(37) 5,500 sq. yd. spall surf.
(38) 2,400 lin. ft. guard rail
(38A) 145 lin. ft. track crossing
(39) Lump sum, pipe culv.
(39A) 325 lin. ft. CMP culv., 24-in. diam.
(40) 2,020 lin. ft. paved gutter
(41) 520 lin. ft. paved gutter at intersection
(42) 650 bbl. Portland cement
(43) 62,000 lb. steel reinf.
(44) 500 hr. furn. bulldozer and operator
(45) 500 hr. furn. 2 cu. yd. dragline and operator

| | (A) | (B) | (C) | (D) | (E) | (F) | (G) | (H) | (I) | (J) | (K) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| (1) | .40 | .70 | 1.00 | .39 | .70 | .33 | .50 | .60 | 1.10 | 1.00 | .24 |
| (2) | .44 | .33 | .55 | .49 | .54 | .50 | .62 | .60 | .59 | .80 | .393 |
| (3) | .345 | .40 | .46 | .37 | .47 | .54 | .54 | .48 | .69 | .60 | .357 |
| (4) | .22 | .26 | .50 | .41 | .42 | .47 | .40 | .45 | .465 | .45 | .313 |

*(Continued on next page)*

# WHERE THERE'S A PUMP IN YOUR PLANS




## Plan with Peerless Centrifugal Pumps

From plan to plant there's a Peerless horizontal centrifugal pump that meets your needs. For the diversified, continuous duty services of private industries and public projects, Peerless Pumps incorporate many proved advantages in design and construction for extended pump life and operative economy.

All along your flow lines, Peerless can provide pumps incorporating the latest principles of hydraulic practice and experience plus the versatility and efficiency you require for *peerless* pumping performance.

For example, the pumps shown above are single stage, double suction, general purpose Type A pumps, a comprehensive line of Peerless pumps offering a capacity range from 50 to 60,000 gpm. There are scores of other Peerless types, hundreds of other Peerless models for thousands of pumping applications. Peerless furnishes horizontals for handling solids in suspension as well as for clear liquids. There are pumps for boosting, circulating, transferring and filtering. They can handle volatile L-P Gases or tricky acid, basic and salt solutions. They can move liquids at high temperatures or they can provide water (or foam) for *Underwriters' approved* fire protection. Duty can be intermittent or continuous; both single and multi-stage units, with the type of drive you desire, are available, meeting widest head and capacity conditions. Pump and driver are engineered as a unit, tested in a modern hydraulic laboratory that duplicates actual field conditions, to match or exceed purchasers' expectations.

Plan with Peerless for all your needs for pumps. Peerless field and sales engineers are located in all principal cities to help you whenever and wherever there's a pump in your plans. For pump engineering information or service, call on them, or if you prefer, write for the latest pump engineering data. The chart at the right lists a number of the types of Peerless horizontal pump bulletins in which you will be interested.

### DO YOU HAVE THE LATEST PUMP DATA?

***Informative Engineering Bulletins Available From Peerless Pumps***

Here are a few of the services Peerless Pumps perform. Request data by Bulletin number.

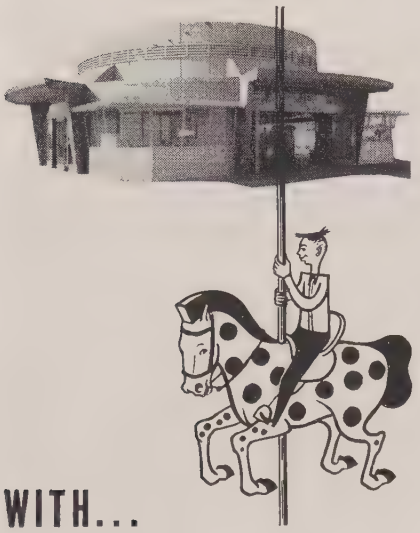
| Pump Service | Bulletin No. |
|---|---|
| Water Supply | B-1300 |
| Fire Protection | B-1500 |
| Chemicals and Oils | B-810 |
| Vaporous Liquids | B-2201 |
| Butane-Propane | B-2200 |
| Boiler Feed | B-301 |
| Sewage and Solids | B-154 |
| Hi-Pressure | B-310 |
| Acids and Caustics | D-2400 |
| Process Services | B-803 |
| All-purpose Pumps | B-2301 |

**Peerless**
**VERTICAL AND HORIZONTAL**
**Pumps**

fmc FOOD MACHINERY AND CHEMICAL CORPORATION
PEERLESS PUMPS

**PEERLESS PUMP DIVISION**
**FOOD MACHINERY AND CHEMICAL CORPORATION**
Los Angeles, California — Indianapolis, Indiana
*District Offices:* New York 5, 37 Wall St.; Chicago 40, 4554 N. Broadway; St. Louis 8, 3908 Olive St.; Atlanta Office: Rutland Bldg., Decatur, Ga.; Omaha, Nebr., 4330 Leavenworth St.; Dallas 1, Tex., 3905 Elm St.; Fresno, Calif.; Los Angeles 31, Calif.

# HOME FOR A... merry-go-round



WITH...

# GUNITE

## by JOHNSON WESTERN

The uses of Gunite seem never ending. Our latest is a permanent, weather resistant structure to house, of all things—a merry-go-round. Here, again, Gunite by Johnson Western proves its versatility, construction speed and practical cost.

At Long Beach, California, on the world famous Pike, is the world's best housed merry-go-round—in an attractive structure, permanently resistant to the corrosive effects of ocean winds, sunlight and salt air. Reinforced Gunite walls and columns were employed.

Gunite by Johnson Western continues to reflect its advantages on all kinds of work; on new construction or rehabilitation, for irrigation uses such as ditches, tanks and reservoirs, and many others.

Gunite by Johnson Western is GOOD Gunite; the result of Johnson Western pioneering, engineering and development—and application by thoroughly trained crews using the finest equipment.

**Write today—or phone for information. On your next job specify—**

GUNITE

by JOHNSON WESTERN

| SAN FRANCISCO | LOS ANGELES | SAN DIEGO |
|---|---|---|
| 4430 Clement St. | P. O. Box 6 | P. O. Box 248 |
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| KEllog 4-9220 | NEvada 6-1791 | HEnley 3-4128 |
| | TErminal 2-4591 | |


| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| (5) | .55 | .40 | .75 | .58 | .49 | .60 | .25 | .69 | .59 | 1.10 | |
| (6) | .35 | .36 | .45 | .45 | .47 | .40 | .46 | .55 | .56 | .60 | |
| (7) | 1.35 | 1.10 | 1.00 | 1.18 | .66 | .65 | 1.00 | 2.60 | 2.48 | 2.00 | |
| (8) | .50 | 1.40 | .60 | .39 | .70 | .40 | .65 | .80 | .47 | 3.00 | |
| (9) | .20 | .45 | .15 | .18 | .20 | .55 | .10 | .60 | .22 | .60 | |
| (10) | .25 | .80 | .15 | .20 | .40 | .80 | .20 | .75 | .48 | 1.00 | |
| (11) | .09 | .13 | .04 | .13 | .11 | .12 | .10 | .10 | .11 | .12 | |
| (12) | .09 | .06 | .10 | .08 | .075 | .064 | .06 | .10 | .10 | .12 | |
| (13) | .15 | .15 | .10 | .13 | .13 | .20 | .45 | .10 | .21 | .20 | |
| (14) | .16 | .19 | .12 | .25 | .16 | .20 | .80 | .15 | .34 | .60 | |
| (15) | .11 | .13 | .10 | .13 | .13 | .17 | .75 | .12 | .34 | .40 | |
| (16) | 2.50 | 1.70 | 2.00 | 1.44 | 2.50 | 2.10 | 1.50 | 2.00 | 3.90 | 3.00 | 1. |
| (17) | .02 | .02 | .02 | .05 | .03 | .026 | .01 | .025 | .03 | .02 | .0 |
| (18) | 2.00 | 3.70 | 3.00 | 5.00 | 3.50 | 4.00 | 6.00 | 3.50 | 1.85 | 5.00 | 1. |
| (19) | 100.00 | 27.00 | 65.00 | 50.00 | 75.00 | 80.00 | 75.00 | 100.00 | 31.00 | 100.00 | 20. |
| (20) | $1,000 | 43.00 | 150.00 | 325.00 | 225.00 | 550.00 | 75.00 | $1,000 | 310.00 | 150.00 | 100. |
| (21) | 3.00 | 6.50 | 16.00 | 14.60 | 11.00 | 7.30 | 10.00 | 15.00 | 4.00 | 30.00 | 8. |
| (22) | .12 | .15 | .30 | .51 | .30 | .17 | .50 | .50 | .70 | 1.00 | |
| (23) | $5,500 | $3,933 | $5,500 | $6,000 | $5,000 | $4,000 | $9,000 | $7,000 | $9,000 | $25,000 | $3,5 |
| (24) | 900.00 | 6.50 | 800.00 | 505.00 | $1,000 | 800.00 | 500.00 | $1,000 | $2,000 | 220.00 | 520. |
| (25) | 18.00 | 27.00 | 20.00 | 17.00 | 35.00 | 50.00 | 25.00 | 40.00 | 50.00 | 60.00 | 17. |
| (26) | .50 | .91 | .50 | .78 | 1.40 | .635 | .50 | 1.00 | .38 | 1.00 | |
| (27) | 2.00 | 1.10 | 1.00 | .94 | 1.40 | 4.30 | 1.00 | 2.00 | 2.20 | 3.00 | |
| (28) | 9.00 | 4.50 | 5.50 | 6.90 | 5.00 | 5.25 | 7.00 | 6.00 | 7.00 | 6.00 | 3. |
| (29) | 10.00 | 8.00 | 8.50 | 8.30 | 7.00 | 7.80 | 8.00 | 12.00 | 12.00 | 7.00 | 5. |
| (30) | 15.00 | 18.00 | 17.50 | 16.90 | 14.50 | 12.00 | 15.00 | 25.00 | 26.00 | 10.00 | 9. |
| (31) | 20.00 | 35.00 | 20.00 | 15.75 | 17.00 | 30.00 | 25.00 | 25.00 | 40.00 | 20.00 | 15. |
| (32) | 500.00 | 650.00 | 750.00 | 450.00 | 900.00 | 650.00 | $1,000 | $1,200 | $1,700 | $1,000 | 654. |
| (33) | 40.00 | 60.00 | 40.00 | 45.00 | 40.00 | 33.00 | 50.00 | 45.00 | 75.00 | 60.00 | 27. |
| (34) | 2.50 | 1.70 | 2.00 | 3.00 | 1.75 | 1.45 | 3.00 | 3.25 | 4.50 | 2.00 | 1. |
| (35) | 1.80 | 1.35 | 1.80 | 2.60 | 1.50 | 1.20 | 2.75 | 3.00 | 3.60 | 2.00 | |
| (36) | 2.00 | 2.40 | 1.50 | 1.25 | 1.40 | 1.00 | .75 | 2.50 | 2.80 | 5.00 | 1. |
| (37) | 1.25 | .50 | 1.50 | 3.25 | 1.40 | .40 | .50 | .75 | .70 | 5.00 | |
| (38) | 3.50 | 3.00 | 4.00 | 4.15 | 4.00 | 4.00 | 3.00 | 4.00 | 5.40 | 10.00 | 3. |
| (38A) | 5.00 | .80 | 7.00 | 9.50 | 9.50 | 9.00 | 20.00 | 6.00 | 11.00 | 50.00 | 6. |
| (39) | 500.00 | 950.00 | 500.00 | 565.00 | 375.00 | $1,150 | $1,500 | $1,250 | $2,500 | $10,000 | 431. |
| (39A) | 8.00 | 4.60 | 7.50 | 9.60 | 3.00 | 6.80 | 5.00 | 10.00 | 20.00 | 5.00 | 7. |
| (40) | 5.00 | 6.50 | 6.00 | 13.00 | 7.50 | 7.30 | 7.50 | 4.00 | 11.50 | 20.00 | 3. |
| (41) | 6.00 | 11.70 | 9.00 | 13.00 | 12.00 | 19.00 | 20.00 | 7.00 | 11.50 | 30.00 | 6. |
| (42) | 4.00 | 7.00 | 6.00 | 6.50 | 6.50 | 6.50 | 8.00 | 6.50 | 8.50 | 8.00 | 6. |
| (43) | .13 | .12 | .15 | .15 | .14 | .18 | .20 | .20 | .25 | .20 | |
| (44) | 12.00 | 9.40 | 10.00 | 9.80 | 13.00 | 11.00 | 15.00 | 14.00 | 11.00 | 12.00 | 10. |
| (45) | 18.00 | 16.00 | 13.00 | 14.35 | 22.00 | 22.50 | 30.00 | 18.00 | 17.00 | 15.00 | 19. |

# Bridge and Grade Separation...

## California—San Diego County—State—Steel and Conc.

Charles MacClosky Co., R. E. Hazard Construction Co. and C. G. Willis & Sons, Inc., San Francisc were low bidders at $1,289,272 for construction of eight steel and concrete bridges and about 2.6 mi. approaches to be graded and surfaced with plant-mixed surfacing between H St. in Chula Vista and 14th S in National City. Unit bids were submitted as follows:

(1) Charles MacClosky Co., R. E. Hazard Construction Co. and C. G. Willis & Sons.....$1,289,272
(2) Winston Bros. Co. ..... 1,314,935
(3) Griffith Co. ..... 1,380,973
(4) Guy F. Atkinson Co. ..... 1,391,000
(5) J. E. Haddock Ltd. & Cox Bros. Construction Co. ..... 1,474,187

| | (1) | (2) | (3) | (4) | (5 |
|---|---|---|---|---|---|
| 1,510 cu. yd. removing concrete | 6.00 | 4.00 | 6.50 | 4.00 | 5.0 |
| Lump sum, clearing and grubbing | $20,971 | $8,000 | $4,200 | $8,000 | $30,00 |
| 7,760 cu. yd. roadway excav. (type A) | 5.00 | 1.75 | 6.00 | 1.20 | 9. |
| 390,000 cu. yd. roadway excav. (type B) | .45 | .42 | .51 | .55 | . |
| 2,520 cu. yd. struct. excav. (type A) | 5.00 | 5.50 | 6.00 | 4.00 | 9. |
| 9,085 cu. yd. struct. excav. (type B) | 1.49 | 2.50 | 2.75 | 2.00 | 2.0 |
| 2,900 cu. yd. struct. backfill | 1.75 | 2.50 | 2.15 | 2.50 | 3. |
| 10,000 cu. yd. ditch and chan. excav. | 1.14 | .35 | 1.25 | .90 | . |
| 1,800 cu. yd. chan. change excav. | 4.00 | .70 | 1.85 | 1.00 | 1. |
| 13,000 sq. yd. compact. orig. ground | .06 | .15 | .05 | .04 | .0 |
| 11,500,000 sta. yd. overhaul | .004 | .004 | .004 | .005 | .00 |
| 2,500 cu. yd. top soil (erosion cont.) | .20 | 1.40 | 1.00 | 3.00 | 1.6 |
| 27,000 sq. yd. prep. slopes (erosion cont.) | .08 | .08 | .10 | .10 | .0 |
| 3 tons fertilizer (erosion cont.) | 100.00 | 90.00 | 100.00 | 100.00 | 90.0 |
| 1,250 lb. seed (erosion cont.) | .35 | .40 | .40 | .40 | . |
| 25 ton straw cover matl. (erosion cont.) | 65.00 | 70.00 | 75.00 | 70.00 | 65.0 |
| Lump sum, dev. water supply and furn. water equip. | $10,650 | $3,500 | $4,500 | $8,000 | $15,5 |
| 8,800 M. gal. applying water | 1.60 | 1.90 | 1.75 | 1.60 | 1.6 |
| Lump sum, finishing roadway | $3,500 | $2,200 | $2,000 | $6,000 | $4,0 |
| 31,000 ton min. aggr. (P.M.C.T.B.) | 1.19 | 1.90 | 1.85 | 2.40 | 2.0 |
| 13,000 bbl. P. C. (P.M.C.T.B.) | 3.89 | 3.40 | 4.50 | 3.80 | 4. |
| 650 ton liq. asph. SC-3, 4 or 5 (B.S.T.) | 19.50 | 20.00 | 21.00 | 26.00 | 18. |
| 79,000 sq. yd. prep. mix. and shap. surface (B.S.T.) | .155 | .12 | .11 | .12 | . |
| 14,300 ton min. aggr. (P.M.S.) | 5.04 | 520.00 | 4.90 | 4.80 | 4. |
| 715 ton pav. asph. (P.M.S.) | 20.50 | 18.50 | 19.00 | 23.00 | 21.0 |
| 18 ton liq. asph. SC-2 (pr. ct.) | 29.00 | 30.00 | 25.00 | 37.00 | 27. |
| 250 ton asph. emuls. (cur. sl. pt. binder and sl. ct.) | 31.00 | 32.00 | 42.00 | 40.00 | 43. |
| 1,030 ton screen (sl. ct.) | 4.50 | 5.70 | 5.25 | 6.50 | 6. |
| 210 lin. ft. P.M. chevrons | 1.00 | 1.00 | 1.00 | 1.30 | 1.0 |
| 2,120 lin. ft. P.M. curbs | .20 | .50 | 1.50 | .80 | .6 |
| 125 lin. ft. P.M. fins | 1.00 | 1.50 | 1.25 | 1.00 | 1.0 |
| 778 cu. yd. class "B" P.C.C. (pavm't) | 21.00 | 27.50 | 17.00 | 20.00 | 17. |
| 160 ea. pavm't tie bolt assem. | 2.00 | 1.00 | .75 | .75 | .6 |
| 1,950 cu. yd. class "B" P.C.C. (base slab) | 18.50 | 27.50 | 17.50 | 18.00 | 25. |
| 505 cu. yd. class "B" P.C.C. (membrane base) | 25.00 | 30.00 | 25.00 | 25.00 | 28. |
| 6,485 cu. yd. class "A" P.C.C. (struc.) | 48.00 | 50.00 | 47.50 | 48.00 | 54.0 |
| 20 cu. yd. class "C" P.C.C. (backfill) | 25.00 | 20.00 | 17.50 | 30.00 | 18.0 |
| 1,605 lin. ft. conc. rail | 5.00 | 6.00 | 6.00 | 9.00 | 5.8 |
| 555 lin. ft. rubber waterstops | 2.40 | 2.30 | 2.50 | 2.40 | 2.0 |
| 282,300 lb. struc. steel | .12 | .14 | .16 | .15 | .1 |
| 65,500 lb. wrought iron plate | .16 | .18 | .21 | .20 | .1 |
| 2,100 lin. ft. furnish treated Douglas fir pil. | 1.90 | 1.40 | 1.35 | 1.25 | 1.6 |
| 10,300 lin. ft. furnish untreated Douglas fir pil. | .60 | .70 | .75 | .85 | .6 |
| 308 ea. driving timber piles | 23.00 | 25.00 | 40.00 | 30.00 | 30.0 |
| 9,250 lin. ft. furnish conc. pil. | 2.64 | 3.00 | 3.25 | 2.90 | 3.0 |
| 185 ea. driving conc. piles | 60.00 | 45.00 | 60.00 | 60.00 | 48.0 |
| 5,545 sq. yd. membrane waterproof. | 2.40 | 2.50 | 1.65 | 4.00 | 2.4 |
| 10 cu. yd. broken conc. riprap | 40.00 | 5.00 | 12.50 | 10.00 | 12. |
| 7 cu. yd. class "A" P.C.C. (slope pav.) | 50.00 | 40.00 | 32.00 | 35.00 | 45.0 |
| 490 cu. yd. class "A" P.C.C. (curbs and gutters) | 40.00 | 34.00 | 33.00 | 35.00 | 39. |
| 370 cu. yd. class "A" P.C.C. (sidewalks) | 30.00 | 27.00 | 25.00 | 33.00 | 37.0 |

*(Continued on next page)*

| | | | | | | |
|---|---|---|---|---|---|---|
| 65 ea. r/w mon. | 7.50 | 10.00 | 6.00 | 7.00 | 6.50 |
| 17 ea. center-line monument | 10.00 | 22.00 | 12 50 | 10.00 | 8.00 |
| 350 lin. ft. reconst. salv. guard railing | 1.00 | 1.50 | 2.00 | 2.50 | 1.00 |
| 27 ea. install culv. markers | 3.00 | 5.00 | 3.00 | 4.00 | 3.75 |
| 69 ea. install clearance marking and guide posts | 5.00 | 5.00 | 5.00 | 5.00 | 3.50 |
| 13 ea. horizontal reflector units | 8.00 | 10.00 | 7.00 | 8.00 | 7.50 |
| 1.2 mi. new prop. fence | $1,000 | $1,000 | $1,250 | $1,500 | $1,400 |
| 376 lin. ft. 12-in. R.C.P. (std. str.) | 2.85 | 3.10 | 2.75 | 3.00 | 2.75 |
| 90 lin. ft. 15-in. R.C.P. (std. str.) | 5.00 | 4.00 | 3.25 | 3.50 | 3.60 |
| 1,334 lin. ft. 18-in. R.C.P. (std. str.) | 3.65 | 4.60 | 4.00 | 4.00 | 4.20 |
| 68 lin. ft. 18-in. R.C.P. (4000-D) | 7.50 | 6.00 | 5.00 | 5.00 | 5.35 |
| 128 lin. ft. 24-in. R.C.P. (std. str.) | 5.25 | 7.00 | 5.25 | 6.00 | 5.90 |
| 408 lin. ft. 30-in. R.C.P. (std. str.) | 6.15 | 9.00 | 6.80 | 7.00 | 7.30 |
| 852 lin. ft. 42-in. R.C.P. (std. str.) | 10.25 | 13.50 | 11.00 | 11.00 | 11.75 |
| 144 lin. ft. 60-in. R.C.P. (std. str.) | 18.00 | 23.00 | 19.00 | 18.00 | 18.50 |
| 214 lin. ft. 12-in. C.M.P. (16 ga.) | 3.00 | 3.00 | 2.00 | 2.00 | 2.25 |
| 158 lin. ft. 24-in. C.M.P. (14 ga.) | 3.50 | 4.00 | 4.00 | 4.50 | 4.10 |
| 120 lin. ft. 72-in. C.M.P. (8 ga.) | 24.50 | 23.00 | 25.00 | 30.00 | 26.00 |
| 400 lin. ft. 42-in. x 11¼-in. part circle C.M. culv. (12 ga.) | 8.00 | 4.00 | 4.50 | 7.00 | 4.00 |
| 44 ea. spillway assemb. | 27.50 | 30.00 | 30.00 | 50.00 | 33.00 |
| 690 lin. ft. 8-in. C.M.P. dn. dr. (16 ga.) | 1.75 | 2.00 | 1.80 | 150.00 | 1.65 |
| 120 lin. ft. salv. exist. pipe culv. | 3.50 | 2.00 | 2.50 | 750.00 | 2.50 |
| 1,056,000 lb. bar reinf. steel | .075 | .08 | .095 | .08 | .09 |
| 65 sq. yd. mesh reinf. | 2.00 | 1.00 | 1.00 | .40 | .65 |
| 1,706 lin. ft. steel rail | 7.00 | 7.20 | 8.00 | 7.50 | 7.50 |
| 234 lin. ft. 6-in. welded steel pipe | 7.00 | 2.50 | 4.00 | 4.00 | 2.00 |
| 106 lin. ft. 8-in. welded steel pipe | 6.00 | 3.50 | 2.75 | 4.00 | 2.20 |
| 29,750 lb. misc. iron and steel | .25 | .30 | .28 | .30 | .25 |
| 6,600 lin. ft. wire mesh fence | 1.30 | 1.40 | 1.35 | 1.30 | 1.40 |
| 5 ea. M. H. frames and covers (curb inlets) | 60.00 | 30.00 | 30.00 | 40.00 | 60.00 |
| 3 ea. M. H. frames and covers (sewer type) | 80.00 | 40.00 | 35.00 | 50.00 | 75.00 |
| 4 ea. frames and grates for grate top inlets | 100.00 | 70.00 | 75.00 | 90.00 | 100.00 |
| 1,640 lb. cast steel frames and covers (type "B") | .60 | .30 | .28 | .30 | .30 |
| 314 sq. yd. protective cover | 3.50 | 3.50 | 3.00 | 4.00 | 3.50 |
| Lump sum, clean and paint exist. pile shells | 850.00 | $1,000 | $1,000 | $1,000 | 800.00 |
| 3,740 lin. ft. metal plate guard rail | 2.75 | 2 90 | 3.40 | 3.00 | 2.75 |
| Lump sum, drainage pump. equip. (F Street) | $5,000 | $4,200 | $6,000 | $10,259 | $5,100 |
| Lump sum, drainage pump. equip. (24th Street) | $2,000 | $2,000 | $3,000 | $4,000 | $1,750 |
| Lump sum, drainage pump. equip. (18th Street) | $4,700 | $4,500 | $7,000 | $8,000 | $4,100 |
| Lump sum, electrical equip. (F Street) | $1,700 | $1,900 | $2,000 | $2,000 | $2,000 |
| Lump sum, electrical equip. (24th Street) | 800.00 | $1,000 | $1,000 | $1,000 | $1,000 |
| Lump sum, electrical equip. (18th Street) | $1,700 | $1,900 | $2,000 | $2,000 | $2,000 |

### Wyoming—Carbon County—State—I-Beam

Charles M. Smith, Thermopolis, Wyo., with a bid of $197,202, was awarded a contract by the Wyoming State Highway Department for construction of four I-Beam spans over the Union Pacific Railroad tracks near Como, Wyo., including grading and draining of approaches and miscellaneous work on 0.322 mi. of the Rawlins-Medicine Bow road. Unit bids were submitted as follows:

(1) Charles M. Smith ..... $197,202
(2) Big Horn Construction Co. ..... 202,293
(3) Etlin E. Peterson ..... 204,785
(4) N. A. Nelson Construction Co. ..... 205,088
(5) Flora Construction Corp. ..... $207,817
(6) Northwestern Engineering Co. ..... 229,772
(7) Engineers' Estimate ..... 180,050

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
|---|---|---|---|---|---|---|---|
| 93,000 cu. yd. excav. | .33 | .35 | .33 | .37 | .30 | .40 | .25 |
| 21,000 cu. yd. excav. (selected embankment) | .35 | .46 | .35 | .35 | .40 | .45 | .35 |
| 357,000 cu. yd. sta. overhaul | .01 | .01 | .01 | .01 | .01 | .01 | .01 |
| 59,800 cu. yd. mi. haul | .19 | .13 | .19 | .16 | .18 | .22 | .16 |
| 1,150 M. gal. watering | 2.50 | 3.00 | 2.50 | 2.50 | 2.00 | 2.20 | 3.00 |
| 250 hr. sheepsfoot roller operation | 14.00 | 15.00 | 14.00 | 10.00 | 10.00 | 11.50 | 11.00 |
| 70 hr. pneumatic tired roller operation | 7.00 | 5.00 | 7.00 | 5.50 | 6.00 | 7.00 | 9.00 |
| 50 hr. equipment roller operation | 10.00 | 15.00 | 10.00 | 12.00 | 12 00 | 12.00 | 12.00 |
| 340 lin. ft. 132-in. M.P.C.M. pipe (78-17) | 64.00 | 64.00 | 65.00 | 62.00 | 75.00 | 68.00 | 65.00 |
| 240 lin. ft. 132-in. M.P.C.M. pipe (710-18) | 64.00 | 64.00 | 65.00 | 62.00 | 75.00 | 68.00 | 55.00 |
| 150 cu. yd. excav. for pipe culverts | 2.00 | 5.00 | 2.00 | 2.50 | 3.50 | 3.00 | 2.00 |
| 175 cu. yd. struct. excav. | 3.00 | 4.00 | 2.00 | 4.00 | 3.00 | 3.00 | 3.00 |
| 640 cu. yd. dry excav. for bridges | 6.50 | 5.00 | 3.00 | 4.00 | 6.00 | 6.00 | 3.00 |
| 180 cu. yd. wet excav. for bridges | 10.00 | 9.00 | 12.00 | 12.00 | 6.00 | 10.00 | 5.00 |
| 585.1 cu. yd. class B concrete | 55.00 | 56.00 | 60.00 | 62.50 | 65.00 | 68.00 | 50.00 |
| 8.3 cu. yd. class C concrete | 55.00 | 56.00 | 60.00 | 75.00 | 65.00 | 68.00 | 50.00 |
| 81,540 lb. reinforcing steel | .125 | .12 | .13 | .13 | .13 | .15 | .13 |
| 211,940 lb. structural steel | .165 | .165 | .18 | .18 | .18 | .20 | .165 |
| 1 ea. galvanized steel gate | 50.00 | 65.00 | 100.00 | 60.00 | 70.00 | 60.00 | 100.00 |
| 1,130 hr. mechanical tamping | 7.00 | 7.00 | 7.00 | 6.50 | 6.00 | 7.00 | 6.00 |
| 320 cu. yd. class 1 riprap | 10.00 | 15.00 | 12.00 | 12.00 | 10.00 | 15.00 | 12.00 |
| 2,750 lin. ft. std. r/w fence (3 wire) | .17 | .25 | .30 | .22 | .15 | .20 | .20 |
| 300 lin. ft. type A r/w fence (26-in.) | .25 | .40 | .40 | .25 | .25 | .30 | .25 |
| 8 ea. end panels | 14.00 | 15.00 | 15.00 | 15.00 | 12.00 | 12.00 | 18.00 |
| 8 ea. brace panels | 12.00 | 10.00 | 15.00 | 10.00 | 10.00 | 14.00 | 16.00 |
| 1,200 lin. ft. wire cable guard fence (2 cable) | 1.90 | 3.50 | 3.00 | 2.50 | 2.50 | 3.50 | 2.00 |
| 4 ea. r/w markers | 10.00 | 12.00 | 20.00 | 10.00 | 10.00 | 9.00 | 10.00 |
| 2 ea. R. C. project markers | 15.00 | 17.00 | 25.00 | 35.00 | 10.00 | 11.00 | 20.00 |
| 1 ea. providing and maintaining field testing laboratory building | 900.00 | $1,000 | 900.00 | 900.00 | 800.00 | $1,000 | 600.00 |

# Irrigation . . .

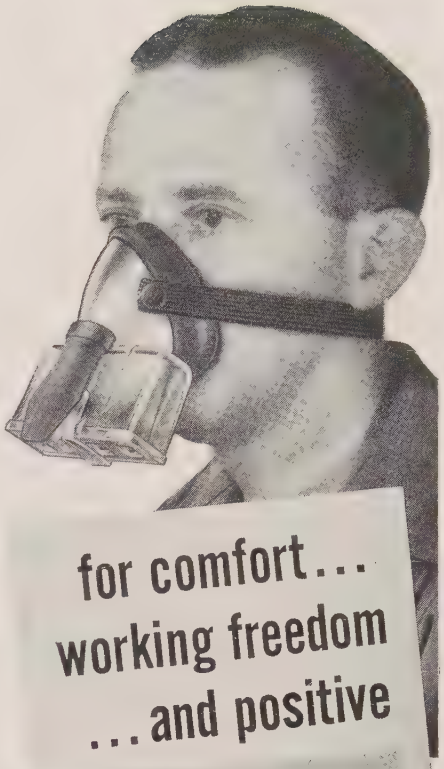
### New Mexico—De Baca County—Bur. of Reclam.—Earthwork and Struct.

Pecos Valley Construction Co., Carlsbad, New Mexico, with a bid of $274,060, was low before the Bureau of Reclamation at Amarillo, Texas, for construction of earthwork, concrete lining and structures for main canal, Sta. 3 plus 00 to Sta. 137 plus 65, on the Fort Sumner Project. Construction of a pumping station is included. Unit bids were submitted as follows:

(1) Pecos Valley Construction Co. ..... $274,060
(2) Texas Construction Co. ..... 283,534
(3) Stebbins-Frost Construction Co. ..... 360,594
(4) Otto B. Ashbach & Sons, Inc. ..... 365,695
(5) Lee Moor Construction Co. ..... 367,464
(6) D. D. Skousen ..... $427,225
— John V. Boldan ..... 445,238
— Stamey Construction Co. ..... 461,650
— Mann Construction Co. ..... 470.688
(7) Engineer's estimate ..... 349,562

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
|---|---|---|---|---|---|---|---|
| 138,000 cu. yd. excav., common, for canal | .29 | .31 | .45 | .38 | .33 | .73 | .45 |
| 35,000 cu. yd. excav., rock, for canal | .98 | 1.07 | 1.30 | 1.86 | 1.60 | .73 | 1.50 |
| 15,000 sq. yd. trim. earth fndtn. for conc. lining | .65 | .72 | .75 | .40 | .55 | 1.00 | .65 |
| 16,000 sq. yd. prep. rock fndtn. for conc. lining | .90 | .42 | .90 | 1.97 | 2.00 | 1.50 | 1.50 |
| 7,000 cu. yd. excav., common, for structs. | 2.00 | .56 | 2.30 | .86 | 2.00 | 2.00 | 1.25 |
| 800 cu. yd. excav., rock for structs. | 3.00 | 2.78 | 5.00 | 11.07 | 3.00 | 5.00 | 4.00 |
| 5,200 cu. yd. backfill | .75 | .59 | .60 | .46 | .60 | .50 | .60 |

*(Continued on next page)*

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## NEW BOOKS . . .

APPLIED HYDROLOGY—By Ray K. Linsley, Jr., Max A. Kohler and Joseph L. H. Paulhus, all of the United States Weather Bureau. Published by McGraw-Hill Book Co., 330 West 42nd St., New York 18, N. Y. 690 pages, 6 x 9. Price $8.50.

This is both a text and reference book for engineering students and practicing engineers. It deals with the factors governing the movement of water in all its phases through the hydrologic cycle. Emphasis is given to a thorough explanation of the fundamental relations involved in hydrologic phenomena, and to the development of practical techniques for computing and forecasting streamflow, evaporation, snowmelt, etc. The application of these techniques to the solution of flood control, irrigation, drainage and related problems is discussed in detail. The authors depart from the pattern of other books in the field in presenting not only the descriptive treatment of hydrology, but also the techniques for correlating hydrologic data in the solution of engineering problems.

* * *

ANNUAL REPORT OF THE NATIONAL BUREAU OF STANDARDS FOR 1948—Published by the National Bureau of Standards, U. S. Department of Commerce, Washington, D. C. 272 pages. Price 25 cents.

The booklet contains an interesting, readable summary of investigations in the physical sciences carried on at the National Bureau of Standards during 1948. The scientific activities described were conducted by the Bureau's 13 divisions concerned with electronics, applied mathematics, atomic and molecular physics, radio propagation, electricity and optics, metrology, heat and power, chemistry, mechanics, organic and fibrous materials, metallurgy, mineral products, and building technology. Research on housing problems receives emphasis, particularly the problem of applying engineering principles to structural design. The development of a magnetic fluid clutch having extensive applications and many unique features is described.

* * *

THE MANUAL OF ACCIDENT PREVENTION IN CONSTRUCTION—Third Revised Edition, published by the Associated General Contractors of America, Munsey Bldg., Washington 4, D. C. 264 pages. Price $3.00.

Purpose of the book is summed up in its preface as follows: "The objective . . . is to make clear, by illustration, specifications and simplified text, the safe way of performing construction work and to emphasize the costly results of incorrect, unsafe practices. No deviation has been made from previous editions with respect to the practical and common sense approach to the subject of

*Continued on page 110*

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1,800 cu. yd. campacted backfill | 1.25 | .61 | 1.85 | 3.25 | 4.40 | 10.00 | 3.5 |
| 200 cu. yd. compacted embankments | 1.00 | .60 | .75 | .68 | 1.00 | 6.00 | .5 |
| 1,000 sta. cu. yd. overhaul | .15 | .07 | .15 | .05 | .05 | .10 | .0 |
| 2,000 cu. yd. excav., common, for drainage channels and dikes | 1.00 | .39 | .60 | .35 | .35 | .70 | .5 |
| 500 cu. yd. excav., rock, for drainage channels and dikes | 2.00 | 1.41 | 2.00 | 2.15 | 1.70 | 1.00 | 2.5 |
| 300 sq. yd. dry-rock paving | 15.00 | 3.60 | 8.00 | 8.00 | 10.00 | 10.00 | 7.0 |
| 2,600 cu. yd. conc. in unreinf. conc. canal lin'g | 25.00 | 37.70 | 32.00 | 25.06 | 35.00 | 40.00 | 30.0 |
| 385 cu. yd. concrete in structs. | 39.50 | 39.00 | 67.50 | 83.39 | 65.00 | 75.00 | 75.0 |
| 71 lin. ft. placing rubber water stops in jts. | .50 | 1.00 | 2.50 | 1.97 | 1.60 | 4.00 | 1.3 |
| 11.5 M.B.M. furn. and erecting untreated timber in structs. | 250.00 | 240.00 | 300.00 | 350.35 | 300.00 | 300.00 | 250.0 |
| 2.5 M.B.M. furn. and erecting treated timber in structs. | 350.00 | 420.00 | 350.00 | 405.90 | 300.00 | 350.00 | 300.0 |
| 39,000 lb. furn. and placing reinf. bars | .10 | .11 | .155 | .16 | .15 | .25 | .1 |
| 4,430 bbl. furn. and handling cement | 4.69 | 5.60 | 6.85 | 6.52 | 6.60 | 7.00 | 6.2 |
| 300 sq. ft. furn. and placing elastic filler matl. in joints | .50 | .55 | 2.50 | 2.21 | 2.00 | 2.00 | 2.0 |
| 88 lin. ft. furn. and laying 30-in. diam. reinf. conc. culvert pipe | 9.25 | 13.00 | 16.00 | 10.97 | 11.00 | 11.50 | 8.0 |
| 424 lin. ft. furn. and laying 48-in. diam. reinf. conc. culvert pipe | 17.39 | 17.00 | 26.00 | 23.23 | 20.00 | 18.00 | 15.0 |
| 288 lin. ft. furn. and laying 54-in. diam. reinf. conc. culvert pipe | 22.56 | 24.00 | 34.00 | 29.59 | 25.00 | 23.00 | 18.0 |
| 188 lin. ft. furn. and laying 60-in. diam. reinf. conc. culvert pipe | 29.90 | 31.00 | 35.00 | 36.90 | 31.00 | 29.00 | 25.0 |
| 104 lin. ft. furn. and laying 60-in. diam. ex. str. conc. culv. pipe for r.r. crossing | 100.00 | 70.00 | 103.00 | 75.65 | 75.00 | 90.00 | 75.0 |
| 1,300 lb. installing slide gates | .25 | .30 | .20 | .31 | .24 | .30 | .2 |
| 20,000 lb. installing turbine and pump | .15 | .14 | .10 | .31 | .20 | .25 | .1 |
| 7,200 lb. installing miscl. metalwork | .20 | .12 | .30 | .41 | .20 | .25 | .2 |
| 180 lin. ft. furn. and erectg. chain-link fence | 4.50 | 8.20 | 5.60 | 5.54 | 7.00 | 5.00 | 4.0 |
| 12 cu. yd. gravel surfacing | 5.00 | 8.00 | 5.00 | 12.30 | 5.00 | 5.00 | 3.0 |
| 6 cu. yd. sand and gravel filter | 5.00 | 7.00 | 10.00 | 13.53 | 10.00 | 10.00 | 8.0 |

# Tunnel . . .

### Idaho—Ada County—Corps of Engineers—Conc. Lined

Puget Sound Bridge and Dredging Co., Seattle, Wash., and Macco Corp., Paramount, Calif., with a bi of $1,169,755, were low before the Walla Walla District, Corps of Engineers, for tunnel construction at Luck Peak dam site 10 mi. southeast of Boise, Ida. The contract calls for excavation of an inlet channel, intak structure, tunnel and outlet structure, and installation of approximately 1,150 lin. ft. of 23-ft. diameter c steel-lined concrete tunnel; also a 46-ft. reinforced concrete tunnel transition section. A total of 365 days i allowed for completion of the work. Unit bids were submitted as follows:

(A) Puget Sound Bridge & Dredging Co. and Macco Corp. ..... $1,169,755
(B) Morrison-Knudsen Co. and J. A. Terteling & Sons ..... 1,178,762
(C) Colonial Construction Co. ..... 1,185,804
(D) Gibbon & Reed Co. ..... 1,204,652
(E) Guy F. Atkinson Co. ..... 1,238,890
(F) Halvorson Construction Co. ..... 1,284,050
(G) Bates & Rogers Construction Corp. 1,299,85
(H) Kenny Construction Co. ..... 1,301,06
(I) Western Contracting Corp. ..... 1,325,08
— T. E. Connolly, Inc. ..... 1,327,71
— Peter Kiewit Sons' Co. ..... 1,496,62
— Lee Hoffman ..... 1,581,54
(J) Government estimate ..... 1,522,61

(1) 80,000 cu. yd. excav., common
(2) 74,000 cu. yd. excav., rock
(3) 28,800 cu. yd. excav., tunnel, unclass.
(4) 100,000 lb. struct. steel for tunnel bracing in place
(5) 10,000 lb. 1½-in. dia. steel spacer rods, with nuts and washers, in place
(6) 40 M.F.B.M. timber lagging, tunnel, in place
(7) 2,325,000 lb. miscl. steel, in place
(8), (9), (10), (11), (12) and (13) deleted
(14) 385 2-in. grout coupling and plug in steel tunnel liner, in place
(15) 8 2-in. grout pipe and coupling in transitio section, in place
(16) 2,500 lin. ft. drilling "EX" grout holes fro tunnel
(17) 1,000 bags of cement, pressure grouting, cut off curtain
(18) 8,600 cu. yd. conc., tunnel lining, in place
(19) 1,550 cu. yd. conc., transition sect., in plac
(20) 16,000 bbl. Portland cement
(21) 130,000 lb. steel, reinf., in place
(22) 650 lb. 20-oz. copper water stops, in place

| | (A) | (B) | (C) | (D) | (E) | (F) | (G) | (H) | (I) | (J) |
|---|---|---|---|---|---|---|---|---|---|---|
| (1) | 1.00 | .50 | 1.50 | .31 | .36 | 1.00 | .60 | .80 | .50 | .5 |
| (2) | 1.00 | 2.05 | 1.50 | 1.05 | 1.15 | 1.00 | 1.55 | 1.60 | 1.75 | 3.5 |
| (3) | 13.00 | 10.50 | 10.00 | 12.95 | 14.00 | 14.00 | 14.15 | 11.00 | 13.60 | 9.9 |
| (4) | .20 | .22 | .30 | .18 | .22 | .18 | .30 | .35 | .18 | .40 |
| (5) | .15 | .30 | .20 | .22 | .33 | .25 | .27 | .40 | .20 | .34 |
| (6) | 300.00 | 300.00 | 350.00 | 165.00 | 300.00 | 250.00 | 400.00 | 400.00 | 175.00 | 260.0 |
| (7) | .135 | .15 | .125 | .159 | .142 | .16 | .138 | .16 | .16 | .21 |
| (14) | 30.00 | 6.00 | 3.00 | 5.50 | 20.00 | 10.00 | 2.50 | 4.00 | 5.35 | 14.5 |
| (15) | 35.00 | 9.00 | 3.00 | 15.00 | 25.00 | 25.00 | 25.00 | 15.00 | 6.50 | 19.3 |
| (16) | 4.00 | 5.50 | 3.00 | 2.70 | 4.25 | 4.00 | 13.50 | 7.00 | 8.00 | 2.0 |
| (17) | 3.00 | 5.50 | 3.00 | 5.00 | 2.00 | 6.00 | 4.80 | 6.00 | 2.25 | 5.9 |
| (18) | 15.00 | 16.50 | 15 00 | 19.50 | 22.90 | 20.00 | 22.40 | 22.50 | 23.75 | 26.8 |
| (19) | 30.00 | 26.00 | 55.00 | 43.00 | 32.00 | 28.00 | 27.60 | 40.00 | 31.75 | 28.2 |
| (20) | 5.00 | 5.00 | 5.50 | 4.25 | 4.50 | 4.50 | 4.05 | 6.00 | 4.50 | 5.2 |
| (21) | .10 | .11 | .12 | .12 | .11 | .12 | .15 | .15 | .11 | .12 |
| (22) | 1.00 | 1.20 | 1.00 | 1.20 | 1.50 | 2.00 | 1.05 | 3.00 | 1.20 | 1.2 |

# Highway and Street . . .

### California—Ventura-Santa Barbara Counties—State—Pave.

Granite Construction Co., Watsonville, Calif., was low bidder before the Calif. Division of Highways a $661,807 for the construction of 2.5 mi. of highway graded and surfaced with Portland cement concrete pave ment on cement treated subgrade and with plant-mixed surfacing on existing pavement and cement stabilize base material to provide a four-lane divided highway. The work is located between .2 mi. east of the Ventur County line and .2 mi. east of Carpinteria, Calif. Unit bids were as follows:

(1) Granite Construction Co. ..... $661,807
(2) Clyde W. Wood, Inc. ..... 674,906
(3) United Concrete Pipe Corp. ..... 679,417
(4) Basich Bros. Construction Co. & Basich Bros. ..... 680,192
(5) Griffith Co. ..... 697,314
(6) Peter Kiewit Sons' Co. ..... $711,08
(7) Guy F. Atkinson Co. ..... 718,56
(8) N. M. Ball Sons' ..... 745,64
(9) Cox Bros. Construction Co. ..... 755,51
(10) Fredrickson & Watson ..... 761,78

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
|---|---|---|---|---|---|---|---|
| 970 cu. yd. remove concrete | 7.50 | 10.00 | 4.60 | 9.00 | 12.50 | 10.00 | 8.2 |
| 134 sta. clearing and grubbing | 100.00 | 45.00 | 100.00 | 182.00 | 62.50 | 75.00 | 70.0 |

*(Continued on next page)*

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 215,200 cu. yd. roadway excav. | .48 | .37 | .40 | .38 | .53 | .62 | .45 |
| 1,720 cu. yd. struct. excav. (br.) | 7.75 | 6.00 | 3.50 | 2.50 | 4.50 | 4.00 | 2.35 |
| 2,200 cu. yd. struct. excav. | 3.00 | 3.00 | 1.40 | 2.25 | 2.90 | 2.75 | 2.85 |
| 600 cu. yd. ditch and channel excav. | 1.50 | 1.75 | .80 | 1.00 | 1.75 | .75 | .85 |
| 13,500 sq. yd. compact. orig. grnd. | .06 | .05 | .05 | .04 | .05 | .06 | .05 |
| 2,550,000 sta. yd. overhaul | .01 | .005 | .007 | .0045 | .005 | .003 | .005 |
| 7,600 tons imp. base material | .85 | 1.10 | .95 | .80 | .95 | 1.25 | 1.00 |
| 17,500 sq. yd. prepar. slopes (erosion control) | .08 | .05 | .09 | .06 | .09 | .04 | .12 |
| 43,000 sq. yd. cultivate. (prep. landscape) | .06 | .04 | .06 | .07 | .07 | .06 | .07 |
| 22 tons straw cover matl. (erosion control) | 60.00 | 40.00 | 70.00 | 55.00 | 70.00 | 45.00 | 57.00 |
| 79,000 ea. mesembryanthemum edule cuttings | .03 | .05 | .03 | .025 | .03 | .05 | .04 |
| Lump sum, dev. wat. supp. & furn. wat. equip. | $10,000 | $2,500 | $15,000 | $19,500 | $5,000 | $6,700 | $3,000 |
| 9,800 M gal. applying water | 1.25 | 1.75 | .95 | 1.00 | 1.30 | 1.75 | 1.30 |
| 134 sta. finishing roadway | 20.00 | 25.00 | 15.00 | 15.00 | 13.00 | 20.00 | 25.00 |
| 7,800 sq. yd. mix. and compct. (cem. stab. select. matl.) | .14 | .14 | .23 | .27 | .37 | .15 | .18 |
| 21,200 tons imp. base matl. (cem. stab.) | 1.40 | 1.10 | 1.55 | 1.80 | 1.65 | 1.45 | 1.45 |
| 45,000 sq. yd. mix. and compact. (C.T.S.) | .20 | .19 | .22 | .15 | .25 | .18 | .20 |
| 6,350 bbl. P. C. (cem. stabilization & C.T.S.) | 4.00 | 3.75 | 4.00 | 4.35 | 3.50 | 3.85 | 4.00 |
| 150 tons liq. asph. SC-2 (pr. ct. & pen. tr.) | 20.00 | 19.00 | 23.00 | 40.00 | 30.00 | 26.00 | 25.00 |
| 120 tons asph. emulsion | 30.00 | 40.00 | 40.00 | 40.00 | 40.00 | 37.00 | 40.00 |
| 330 tons screenings (sl. ct.) | 6.00 | 6.00 | 5.75 | 5.10 | 5.00 | 6.00 | 5.75 |
| 12,200 tons min. aggr. (P.M.S.) | 3.50 | 4.25 | 4.35 | 3.00 | 3.85 | 4.35 | 4.40 |
| 680 tons pav. asph. (P.M.S.) | 20.00 | 17.00 | 15.60 | 15.00 | 16.00 | 17.00 | 15.50 |
| 15 tons liq. asph. SC-3 (P.M.S. stkpld.) | 20.00 | 17.00 | 20.00 | 17.00 | 17.00 | 17.00 | 15.50 |
| 330 lin. ft. raised bars | 1.00 | 1.00 | .85 | 1.00 | 1.15 | 1.00 | 1.20 |
| 33,000 sq. ft. placing P.M.S. (gutrs., ditches and slope drns.) | .10 | .10 | .19 | .10 | .16 | .06 | .20 |
| 3,500 lin. ft. placing P.M.S. (dikes) | .15 | .10 | .25 | .15 | .26 | .25 | .18 |
| 9,900 cu. yd. P.C.C. (pavement) | 12.00 | 14.00 | 15.75 | 14.00 | 14.70 | 15.00 | 16.00 |
| 6,600 ea. pavement tie bolt assemblies | .40 | .60 | .55 | .60 | .55 | .60 | .50 |
| 1,167 cu. yd. Cl. "A" P.C.C. (struct.) | 62.50 | 75.00 | 65.00 | 70.00 | 64.00 | 58.00 | 78.50 |
| 930 cu. yd. Cl. "A" P.C.C (arch ring) | 37.00 | 43.00 | 37.50 | 40.00 | 39.00 | 38.00 | 43.50 |
| 923 lin. ft. conc. railing | 5.50 | 8.00 | 7.00 | 12.00 | 5.60 | 5.75 | 8.80 |
| 80,000 lb. struct. steel | .11 | .12 | .12 | .12 | .13 | .13 | .15 |
| 5,200 lb. misc. steel | .45 | .50 | .35 | .40 | .40 | .35 | .50 |
| 140 cu. yd. broken conc. rip-rap | 5.00 | 10.00 | 8.00 | 10.00 | 10.00 | 22.00 | 23.00 |
| 313 cu. yd. P.C.C. (curbs) | 35.00 | 40.00 | 35.65 | 40.00 | 39.00 | 48.00 | 34.00 |
| 365 ea. curb dowels | 1.00 | .50 | .80 | 1.00 | .70 | 1.00 | .80 |
| 150 lb. steel angles (curb inlets) | .60 | .50 | .30 | .30 | .30 | .60 | .60 |
| 95 ea. r/w monuments | 5.00 | 7.00 | 5.00 | 5.00 | 6.00 | 7.75 | 7.25 |
| 11 ea. center line monuments | 25.00 | 8.00 | 17.00 | 10.00 | 7.00 | 11.00 | 6.00 |
| 290 ea. instal. met. culv. mark, clearance mark and grade posts | 4.00 | 3.00 | 3.00 | 1.50 | 4.00 | 2.70 | 3.50 |
| 1.3 mi. new prop. fence | $1,400 | $1,150 | $1,050 | $1,100 | 900.00 | 850.00 | $1,050 |
| 2,175 lin. ft. chain link fence | 1.20 | 1.25 | 1.20 | 1.50 | 1.10 | 1.00 | 1.15 |
| 74 lin. ft. 12-in. C.M.P. (16 ga.) | 2.00 | 2.00 | 1.50 | 2.00 | 2.00 | 1.80 | 1.75 |
| 570 lin. ft. 18-in. C.M.P. (16 ga.) | 3.00 | 2.85 | 2.10 | 2.50 | 2.60 | 2.35 | 2.50 |
| 1,430 lin. ft. 24-in. C.M.P. (14 ga.) | 5.00 | 4.15 | 3.50 | 3.50 | 3.80 | 3.50 | 3.60 |
| 40 lin. ft. 30-in. C.M.P. (14 ga.) | 6.00 | 5.00 | 4.60 | 4.00 | 5.00 | 4.30 | 4.65 |
| 310 lin. ft. 36-in. C.M.P. (12 ga.) | 8.00 | 7.50 | 5.85 | 6.00 | 7.00 | 6.75 | 7.25 |
| 96 lin. ft. 18-in. x 11-in. C.M.P. arch (16 ga.) | 3.00 | 3.25 | 2.30 | 2.75 | 3.00 | 2.75 | 3.00 |
| 6 ea. spillway assemblies | 30.00 | 35.00 | 25.00 | 30.00 | 25.00 | 30.00 | 28.00 |
| 120 lin. ft. 8-in. C.M.P. downdrns. (16 ga.) | 2.00 | 2.65 | 1.45 | 1.60 | 1.70 | 2.50 | 1.50 |
| 2 ea. down drn. slip jts. | 15.00 | 15.00 | 16.00 | 20.00 | 12.50 | 10.00 | 15.00 |
| 2 ea. pipe anchors | 20.00 | 20.00 | 8.00 | 25.00 | 6.00 | 6.00 | 20.00 |
| 133 lin. ft. salvag. exist. pipe culv. | 1.00 | 3.00 | .75 | 1.00 | 1.00 | 1.20 | 1.25 |
| 40 lin. ft. relay. salvaged C.M.P. | 1.00 | 2.00 | .75 | 1.50 | 1.00 | 1.20 | 1.25 |
| 313,000 lb. bar reinf. steel | .09 | .13 | .095 | .10 | .10 | .09 | .11 |
| 348 sq. yd. mesh reinforcement | .65 | 1.50 | .25 | .35 | 1.00 | 1.00 | .80 |
| 21 ea. horizontal reflector units | 5.00 | 10.00 | 7.00 | 5.00 | 8.00 | 7.50 | 11.00 |
| 1,320 lin. ft. temp. grd. rail | 2.50 | 2.25 | 2.00 | 4.00 | 3.00 | 4.00 | 2.90 |
| Lump sum, remov. and salvag. exist. met. crib | 300.00 | 200.00 | 200.00 | 300.00 | 600.00 | 200.00 | 600.00 |
| 2,365 lin. ft. metal plate gd. rail | 3.00 | 3.25 | 2.00 | 3.00 | 3.00 | 3.00 | 2.80 |
| Lump sum, engineer's office | $1,800 | $1,750 | $1,400 | $2,500 | $1,200 | $1.500 | $2,400 |

## Washington—Lewis and Pacific Counties—State—Grade and Surf.

Pacific Sand & Gravel Co., Centralia, Wash., was low before the Washington Department of Highways with a bid of $319,703 for the grading and surfacing with btiuminous penetration macadam Type D on approx. 7.5 mi. of the highway from Beam Road to Pe Ell and Pe Ell to Pluvius. Unit bids were submitted as follows:

(1) Pacific Sand & Gravel Co. ..... $319,703
(2) Guy F. Atkinson Co. ..... 323,253
(3) N. Fiorito Co. ..... 361,334
(4) Strong & MacDonald, Inc. ..... 376,567
(5) Guy J. Norris ..... 418,518
(6) Wm. and John T. Fusco Construction Co. ..... $423,612
— C. J. Eldon ..... 458,003
— J. D. Shotwell Co. ..... 459,712
— Peter Kiewit Sons' Co. ..... 478,593

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| 34.72 aces clearing | 300.00 | 310.00 | 350.00 | 400.00 | 375.00 | 400.00 |
| 29.09 acres grubbing | 300.00 | 100.00 | 300.00 | 400.00 | 375.00 | 400.00 |
| Lump sum, clearing and grubbing | $1,000 | $6,000 | $12,000 | $4,000 | $8,000 | $7,000 |
| 33,640 cu. yd. com. excav. incl. haul of 600 feet | .55 | .60 | .52 | .45 | .50 | .60 |
| 4,470 cu. yd. solid rock excav. incl. haul of 600 feet | 1.50 | 1.40 | 1.30 | 1.00 | 1.40 | 2.00 |
| 694 cu. yd. com. trench excav. incl. haul of 600 feet | 2.50 | 1.25 | 2.50 | 1.00 | 2.00 | 1.50 |
| 1,180 cu. yd. sta. overhaul | .03 | .03 | .03 | .02 | .03 | .03 |
| 253.06 M. cu. yd. sta. overhaul | 6.00 | 8.00 | 5.00 | 5.00 | 5.00 | 6.00 |
| 515 cu. yd. struct. excav. | 3.50 | 4.00 | 2.50 | 2.00 | 3.00 | 3.00 |
| 9 days mechanical tamper | 40.00 | 62.00 | 20.00 | 40.00 | 40.00 | 40.00 |
| 5,920 lin. ft. slope treatment class A | .20 | .20 | .15 | .20 | .20 | .15 |
| 395.7 stas. (100 ft.) finishing roadway | 12.00 | 8.00 | 10.00 | 10.00 | 20.00 | 10.00 |
| 1,220 M. gals. water in place | 1.00 | 2.50 | 4.00 | 2.00 | 3.00 | 2.00 |
| 16,730 tons cr. stone surf. top course in place | 1.75 | 1.90 | 1.85 | 2.05 | 2.25 | 2.35 |
| 15,720 tons cr. stone surf. base course in place | 1.55 | 1.75 | 1.85 | 2.05 | 2.10 | 2.25 |
| 15,170 tons cr. stone surf. top course in stockpile | 1.60 | 1.50 | 1.74 | 2.05 | 2.05 | 2.10 |
| 7,680 tons cr. stone surf. base course in stockpile | 1.37 | 1.40 | 1.72 | 2.05 | 1.95 | 2.00 |
| 61,520 tons ballast in place | 1.50 | 1.65 | 1.75 | 1.62 | 2.05 | 1.97 |
| 20,290 tons ballast in stockpile | 1.30 | 1.25 | 1.55 | 1.62 | 2.00 | 1.80 |
| 3,160 tons crushed cover stone in stockpile | 1.70 | 1.60 | 1.85 | 2.05 | 2.20 | 2.20 |
| **MIN. AGGR. FOR NON-SKID SINGLE SEAL TREAT. SCH. A IN STOCKPILE** | | | | | | |
| 6,600 tons coarse cr. screen. ⅝-in. to ¼-in. in stockpile | 2.13 | 1.57 | 2.05 | 3.25 | 2.30 | 2.60 |
| 2,080 tons fine cr. screen. ¼-in. to 0-in. in stockpile | 2.13 | 1.57 | 1.95 | 3.25 | 2.30 | 2.60 |
| **MIN. AGGR. FOR BIT. PENETRATION MACADAM TYPE D IN STOCKPILE** | | | | | | |
| 6,960 tons base course 1½-in. to ¾-in. in stockpiles | 1.83 | 1.25 | 1.62 | 2.05 | 2.00 | 2.60 |
| 1,810 tons keystone ¾-in. to ½-in. in stockpiles | 1.83 | 1.35 | 1.77 | 2.05 | 2.00 | 2.60 |
| 2,690 tons coarse cr. screen. ½-in. to No. 4 sieve in stkpl. | 1.83 | 1.35 | 1.77 | 3.25 | 2.00 | 2.60 |
| 710 tons fine cr. screen No. 4 sieve to 0 in stkpl. | 1.83 | 1.35 | 1.77 | 3.25 | 2.00 | 2.60 |
| **MISCELLANEOUS ITEMS** | | | | | | |
| 10 cu. yd. concrete class A in place | 100.00 | 86.00 | 100.00 | 75.00 | 80.00 | 60.00 |
| 1,100 lb. steel reinf. bars in place | .20 | .16 | .15 | .10 | .15 | .12 |

*(Continued on next page)*

# When Safety Hangs by Threads

For hanging concrete form work from structural steel, Richmond Hanging Systems include a full variety of carefully engineered devices to meet every possible condition. Each is an application of the Richmond principle, in which the threaded Tylag *safely* transmits to the loads up to as heavy as 20,000 lbs. Section C of our new catalog illustrates and describes Richmond Form Hanging devices and explains the strength, speed, efficiency and economy they bring to the job. Use the coupon below for your copy of catalog.

MANUFACTURERS of ENGINEERED TYING DEVICES, ANCHORAGES and ACCESSORIES for CONCRETE CONSTRUCTION

**DO IT NOW!**

RICHMOND SCREW ANCHOR CO., INC.
820 Liberty Avenue, Brooklyn 8, N. Y.

Gentlemen: Please rush me your new Richmond Catalog. No cost or obligation to me, of course.

NAME_____
ADDRESS_____
CITY_____ STATE_____

# NEW BOOKS...

Continued from page 108

accident prevention. Keeping in mind the busy superintendent, the text has been reduced as much as is considered compatible with clarity." A member of the A. G. C. national staff devoted almost all of his time for one year to the job of revising the manual.

* * *

WELDED STEEL PENSTOCKS—DESIGN AND CONSTRUCTION—By P. J. Bier, Mechanical Engineering Division, Branch of Design and and Construction, U. S. Bureau of Reclamation. 40 pages, 8 x 11. Price 25 cents.

This monograph presents information concerning modern design and construction methods for pressure vessels applied to penstocks for hydroelectric power plants. Data are based on some 20 years experience in penstock construction by the Bureau of Reclamation. Improvements made in the manufacture of welding quality steel, in welding processes and procedures, and in inspection and testing of welds are taken into account. Progress made in the analytical determination of stesses in thin cylindrical shells is also discussed.

* * *

TECHNICAL SKETCHING AND VISUALIZATION FOR ENGINEERS—By Hyman H. Katz. Published by the MacMillan Co., 60 Fifth Ave., New York City. 163 pages, 8 x 11. Price $5.00.

The author demonstrates in detail the techniques by which anyone, with or without drawing aptitude, can become adept in this universal language of engineering. Beginning with freehand drawing of lines and curves, he shows how to gain skill in proportion, visual approximation, projection, and finally in pictorial drawing and shading. Useful chapters on measurements and on cut-outs, models and other non-graphical methods of visualization are included.

## House Building Upsurge

PRELIMINARY REPORTS of Federal Housing Administration operations for October disclose an unprecedented continuation of the 1949 upsurge in home building throughout the United States.

Dwelling units started under the FHA plan in October totaled 42,239, which is 9 per cent over the all-time FHA record high of 38,882 in June, 1949.

Applications for FHA mortgage insurance on both new and existing construction covered an unexpected 66,913 units for October as compared with 64,309 in September. For the first ten months of 1949 unit applications totaled 675,828 as compared with 502,942 for the same period last year. In fact, unit applications for the first ten months of 1949 exceeded the 584,854 unit applications for all 12 months of 1948.

| | | | | | | |
|---|---|---|---|---|---|---|
| 65 lin. ft. conc. or V. C. drain pipe 8-in. diam. in pl. | 1.25 | 1.25 | 1.00 | 1.00 | 2.50 | 1.0 |
| 135 lin. ft. pl. conc. culv. pipe 12-in. diam. in place | 2.25 | 1.75 | 1.50 | 2.00 | 2.00 | 1.5 |
| 75 lin. ft. pl. conc. culv. pipe 18-in. diam. in place | 3.25 | 3.00 | 2.55 | 2.50 | 3.00 | 3.0 |
| 18 lin. ft. std. reinf. conc. culv. pipe 12-in. diam. in pl. | 3.25 | 2.50 | 2.25 | 2.50 | 2.50 | 2.0 |
| 486 lin. ft. std. reinf. conc. culv. pipe 18-in. diam. in pl. | 2.50 | 4.00 | 3.50 | 3.00 | 3.50 | 3.5 |
| 50 lin. ft. place corr. metal culv. pipe No. 16 ga. 18-in. diam. in place | 3.50 | 3.60 | 3.75 | 3.50 | 3.50 | 4.0 |
| 1 only place corr. metal conn. ell No. 16 ga. 18-in. diam. in place | 17.50 | 20.00 | 15.00 | 25.00 | 20.00 | 6.0 |
| 381 lin. ft. relaying conc. culv. pipe 12-in. diam. | 1.00 | .75 | 1.50 | .50 | 1.50 | 1.5 |
| 44 lin. ft. galv. iron water pipe ¾-in. diam. in place | .75 | 1.00 | 1.00 | .35 | 1.00 | 1.0 |
| 20 lin. ft. galv. iron water pipe 1¼-in. diam. in place | 1.00 | 1.10 | 1.50 | .50 | 1.75 | 2.0 |
| 20 lin. ft. galv. iron water pipe 2-in. diam. in place | 1.25 | 1.40 | 2.00 | .75 | 2.00 | 2.0 |
| 30 lin. ft. galv. iron water pipe 3-in. diam. in place | 1.50 | 2.00 | 3.00 | 1.25 | 4.00 | 2.0 |
| 123 lin. ft. relaying iron water pipe ¾-in. diam. in place | 1.00 | 1.00 | 1.00 | .25 | 1.00 | .5 |
| 50 lin. ft. relaying iron water pipe 1¼-in. diam. in pl. | 1.00 | 1.10 | 1.50 | .35 | 1.00 | .5 |
| 400 lin. ft. relaying iron water pipe 2-in. diam. | 1.00 | 1.40 | 1.00 | .50 | 1.25 | .5 |
| 40 only reinf. conc. right-of-way markers in place | 7.50 | 9.00 | 6.00 | 5.00 | 10.00 | 6.0 |
| 2,966 lin. ft. remov., reset and repaint cable guard rail | 1.25 | 1.55 | 1.00 | 1.00 | 2.00 | 1.5 |

### California—Monterey County—State—Drainage System

Bidding $24,706, W. M. Lyles Co., Avenal, Calif., was low before the California Division of Highways for construction of a drainage system of 12- to 24-in. welded steel pipe for the highway at White Creek about 16 mi. north of San Simeon. Unit bids were submitted as follows:

| | | | |
|---|---|---|---|
| (1) | W. M. Lyles Co. | $24,706 | |
| (2) | Wm. Radtke & Son | 27,398 | |
| (3) | Mathews Construction Co. | 36,985 | |
| (4) | Stolte, Inc. | 41,353 | |
| (5) | Granite Construction Co. | 44,657 | |
| (6) | F. T. Haas Co. | $45,80 | |
| — | Pisano Bros. | 61,77 | |
| — | Ferguson Bros. | 78,71 | |
| — | Green-Mears Construction Co., Inc. | 89,50 | |

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| 2,700 cu. yd. pipe line excav. | 1.50 | 1.83 | 4.00 | 5.30 | 5.83 | 7.0 |
| 4,300 cu. yd. ditch and channel excav. | 1.20 | 1.52 | 2.00 | 1.80 | 1.96 | 2.0 |
| 100 cu. yd. structure excav. | 15.00 | 19.00 | 9.00 | 18.94 | 18.43 | 10.0 |
| 18 cu. yd. class "A" P.C.C. (struct.) | 120.00 | 107.00 | 100.00 | 111.10 | 108.00 | 100.0 |
| 15 cu. yd. sacked concrete riprap | 75.00 | 56.00 | 50.00 | 49.00 | 45.00 | 50.0 |
| 2,200 lin. ft. 12-in. welded steel pipe (10 ga.) | 3.50 | 3.83 | 5.00 | 4.95 | 5.42 | 5.0 |
| 110 lin. ft. 14-in. welded steel pipe (10 ga.) | 4.15 | 3.90 | 5.50 | 6.60 | 7.16 | 7.0 |
| 70 lin. ft. 16-in. welded steel pipe (10 ga.) | 5.00 | 4.25 | 6.50 | 7.60 | 8.36 | 8.0 |
| 60 lin. ft. 24-in. welded steel pipe (10 ga.) | 7.00 | 5.75 | 7.50 | 10.00 | 10.92 | 10.0 |
| 3 ea. reducers 24-in. to 12-in. weld. steel pipe (10 ga.) | 65.00 | 27.00 | 75.00 | 95.00 | 98.00 | 50.0 |
| 11 ea. reducers 14-in. to 12-in. weld. steel pipe (10 ga.) | 45.00 | 15.75 | 40.00 | 58.00 | 63.00 | 25.0 |
| 1 ea. 12-in. welded steel pipe 30° elbow (10 ga.) | 45.00 | 29.00 | 20.00 | 26.00 | 28.50 | 50.0 |
| 1 ea. 16-in. to 12-in. welded steel pipe reduc. elbow (10 ga.) | 90.00 | 41.10 | 100.00 | 105.00 | 115.00 | 60.0 |
| 1 ea. 12-in. welded steel pipe 40° elbow (10 ga.) | 45.00 | 29.00 | 30.00 | 40.00 | 45.00 | 50.0 |
| 2 ea. 12-in. x 6-in. weld. steel pipe blow-off branches (10 ga.) | 100.00 | 27.50 | 20.00 | 39.00 | 44.00 | 50.0 |
| 1 ea. 12-in. welded steel plate diffusor | 50.00 | 54.00 | 50.00 | 45.00 | 49.00 | 100.0 |
| 2 ea. redwood covers | 10.00 | 24.50 | 25.00 | 25.00 | 30.00 | 15.0 |
| 500 lb. bar reinforcing steel | .25 | .23 | .20 | .24 | .22 | .3 |
| 1,400 lb. misc. iron and steel | .35 | .80 | .40 | .35 | .38 | .6 |
| 2 ea. install. metal culvert markers | 15.00 | 6.00 | 5.00 | 25.00 | 30.00 | 10.0 |

Turns on a dime, backs into loading position under mixer discharge . . . loaded and ready to go in a jiffy!

Neatly balanced bucket body lifts easily for fast discharge of load — Wisconsin Engine does the heavy work of hauling.

FASTER DELIVERY from MIXER to FILL with this "CONCRETE CART!"

It's WISCONSIN-Powered!

This modern "Concrete Cart" built by Modern Welding & Mfg. Co., and powered by a Wisconsin Heavy-Duty Air-Cooled Engine, is another typical example of the added economy . . . savings in time and labor made possible by power equipment!

Buyers and builders of equipment welcome Wisconsin power because of the delivered dependability . . . year-in and year-out reliability gained through such features as freeze-proof, heat-proof air-cooling, sub-zero to 140° . . . Timken tapered roller bearings at BOTH ends of the crankshaft, taking up ALL thrusts . . . and the high-tension, rotary-type OUTSIDE magneto with impulse coupling, assuring all-weather quick starting and steady running.

Write today for information! 4-cycle, single-cylinder, two-cylinder, and V-type four-cylinder models, 2 to 30 hp.

WISCONSIN MOTOR CORPORATION
World's Largest Builders of Heavy-Duty Air-Cooled Engines
MILWAUKEE 14, WISCONSIN

# PROTECTION SERVICE

## Covers Every Pipe-coating Need

**Materials and Application Procedure for:**

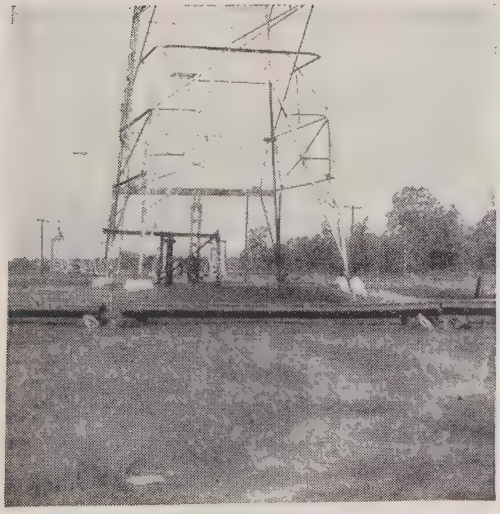
1. Water Industries
2. Natural Gas, Crude Oils and Products Transmission
3. Professional Application in Plants and Yards
4. Distribution Systems
5. Reconditioning Operations
6. Gathering Systems
7. Recycling Operations

## Materials and Application Procedure for

# GATHERING SYSTEMS

In the natural gas and crude oil industries, gathering systems are taking on constantly increasing importance. With pipe diameters ranging from 2″ to 30″, these systems involve a large capital investment, deserving of the highest degree of care for their protection.

Barrett* Enamels and Barrett Protection Service afford an effective and economical means of extending the useful life of such gathering systems. Pre-coated pipe is easily laid and professional application is available at coating yards, pipe mills or rail heads. Modern equipment also permits economical application over the ditch.



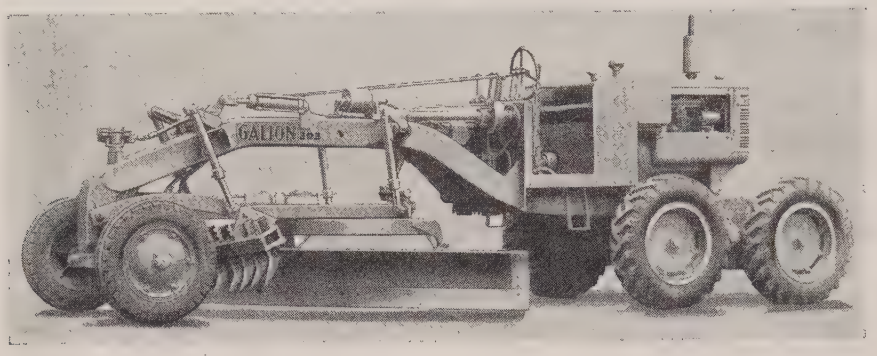
Barrett offers an expert supervision service in connection with application plants and yards. Owners wishing to avail themselves of the advantages of professional application can have the work done with Barrett materials and under Barrett supervision. We will be glad to supply further information upon request.

**THE BARRETT DIVISION**
ALLIED CHEMICAL & DYE CORPORATION
40 Rector Street, New York 6, N. Y.

*Reg. U. S. Pat. Off.

# NEW EQUIPMENT

*MORE COMPLETE INFORMATION of any of the new products or equipment briefly described on the following pages may be had by sending your request to Equipment Service, Western Construction News, 609 Mission Street, San Francisco 5, Calif. For quicker service, please designate the item by number.*




**1201**

## Economical Motor Grader

**Manufacturer:** Galion Iron Works and Mfg. Co., Galion, Ohio.

**Equipment:** Galion No. 303 motor grader, with either a gasoline or Diesel engine.

**Features claimed:** The No. 303 has been produced to fulfill the need for a rugged, medium-duty grader at the lowest possible price consistent with quality. Both available engines are rated for 45 h.p. at 1600 r.p.m. A choice is given between an all-gear 4-wheel tandem drive or single drive. Eight overlapping forward and two reverse speeds assure maximum performance under all operating conditions. Rear tire size on the tandem drive is listed as 10.00-24 and on the single drive, 13.00-20. Front tire size is 7.00-20, with 10.00-20 available if desired. The grader can be obtained with either manual or Hydraulic Booster steering. Basic weights, without scarifier, are from 13,145 lb. (tandem drive) or 11,400 lb. (single drive). All operations of the blade, scarifier, and leaning front wheels are completely hydraulic. Adjustments are instantly and accurately made by finger-tip touch on the control levers. Blade is adjustable 360 deg. horizontally for operation in reverse, and 90 deg. vertically for bank cutting. Standard equipment includes an electric starter.

**1202**

## Rubber Springs for Tractor Seats

**Manufacturer:** United States Rubber Co., Akron, Ohio.

**Equipment:** Springs consisting of a thick layer of rubber sandwiched between two metal plates.

**Features claimed:** Mounted in pairs on tractor seats, the rubber twists and turns with each bump and jolt, cushioning the initial shock and leveling out the sharp rebound which normally occurs with the use of a heavy steel spring. This cushioning effect gives the operator a "floating" ride which lessens body fatigue and helps prevent internal injury from heavy shocks. The springs can be adjusted for various weights.

**1203**

## Power Units

**Manufacturer:** Hercules Motors Corp., Canton, Ohio.

**Equipment:** Three new 4-cylinder gasoline power units.

**Features claimed:** The new models are the JX4E with 3½-in. bore x 4¼-in. stroke and 164 cu. in. displacement, the JX4C with 3¾-in. bore x 4¼-in. stroke and 188 cu. in. displacement, and the JX4D with 4-in. bore x 4¼-in. stroke and 214-cu. in. displacement. The three models are designed for high speed, heavy-duty service where portable power can be used to advantage. Reducing the power spread which has existed between the firm's 4-cylinder unit of 133 cu. in. displacement and a 6-cylinder unit of 221 cu. in. displacement, it places Hercules in a position to offer the trade one of the most extensive lines of gasoline and Diesel power units now available from one engine builder.

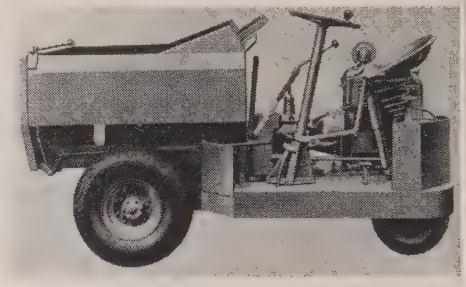
**1204**

## Material Handling Truck

**Manufacturer:** Kalamazoo Mfg. Co., Kalamazoo, Mich.

**Equipment:** The Kal-Truk, designed to accommodate two different types of material handling bodies.

**Features claimed:** The Kal-Truk with dump body is standard, and an interchangeable all-steel platform body is available if



desired. The truck with its 13-h.p. air-cooled motor, has a load carrying capacity of up to 3,000 lb. It has three speeds forward and a reverse. Operated like a tractor, direct discharge of materials from hopper, bins or mixers is possible into the ⅔-cu. yd. dump body. The operator has complete control of unloading operations. The truck has a very short turning radius and can move at speeds up to 15 m.p.h.

**1205**

## Non-Skid Truck Tire

**Manufacturer:** Goodyear Tire & Rubber Co., Akron, Ohio.

**Equipment:** Tire with a deep non-skid surface and a tread contour that is wider and flatter.

**Features claimed:** The tread has a non-skid design of zig-zag grooves and notches that supply a multitude of road-gripping edges, important in preventing "jack-knifing" of a heavy vehicle. Other outstanding features of the Hi-Miler Xtra Tred include the use of either rayon or nylon cord. Sizes range from 8.25 through 11.00 and are immediately available.


Bucket STYLES CHANGE ALSO

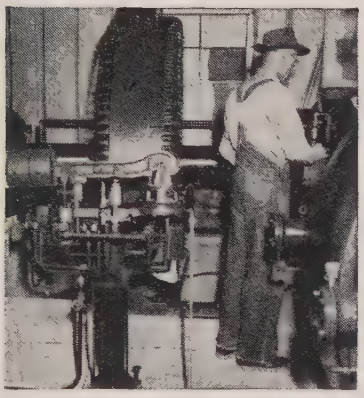
Get latest Information about ADVANCED MODELS

in this NEW Owen CATALOG

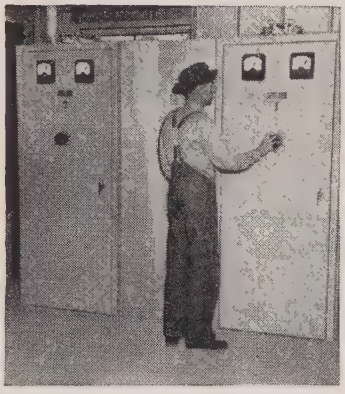
OWEN BUCKET CO., LTD.
BERKELEY, CALIFORNIA
Dealers: Los Angeles, Spokane, Seattle, Portland, Salt Lake City, Honolulu

# putting a MILLION cu. yds. of concrete in its place

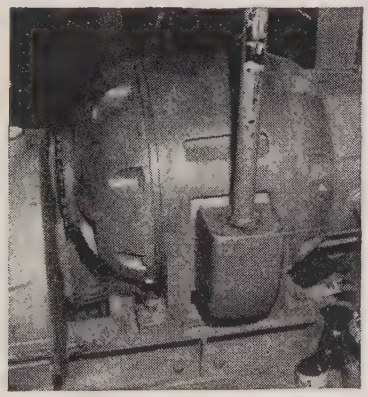
## ... Electrically



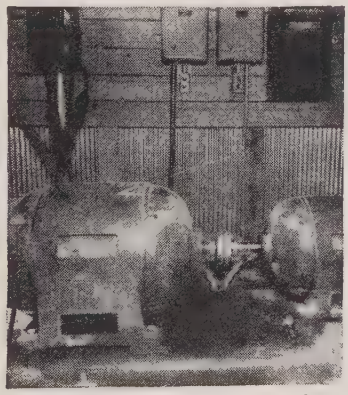
G-E 500-hp motor drives two 3000 cu. ft. Ingersoll Rand air compressors



Synchronous motor starter and control for air compressors



G-E motor-generator set operates frequency converters that run vibrators



200 hp G-E motor operates the hoisting mechanism of the American Revolver Crane

### *Contractors at Clark Hill Dam rely on G-E powered equipment to meet stiff work schedule*

When you're working around the clock on a big construction job, there's no time for shutdowns. Your equipment has got to be reliable, easy-to-maintain, and safe. That's why Allstates Constructors, Inc., and the Corps of Engineers are making extensive use of *electrically driven* construction equipment—from vibrators to giant revolving cranes—for placing concrete at Clark Hill.

More and more machinery manufacturers and contractors are discovering the time- and money-saving advantages of dependable *electric drive.* And with G-E drive they get the added advantage of expert engineering assistance in application, installation, and service—wherever the job may be.

*Ask him Today!*

**Whether you buy or build construction equipment, your G-E representative can show you how to do a better job—at lower cost—by complete electrification. Write him now, and he'll call on you at your convenience.**

*Electrified Construction*
BETTER PRODUCT
LOWER COST

WESTERN PLANTS OR SERVICE SHOPS: Anaheim, Denver, Los Angeles, Oakland, Ontario, Richland, Salt Lake City, San Diego, San Francisco, San Jose, Seattle. WESTERN SALES OFFICES: Bakersfield, Butte, Denver, Fresno, Los Angeles, Medford, Oakland, Pasco, Phoenix, Portland, Riverside, Sacramento, Salt Lake City, San Diego, San Francisco, San Jose, Seattle, Spokane, Stockton, Tacoma.

**GENERAL ELECTRIC**

664-5

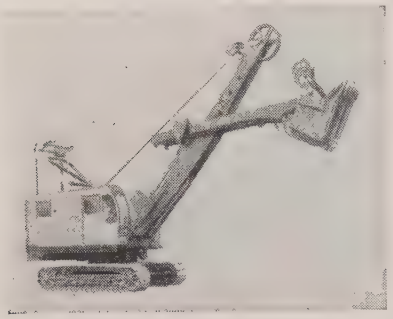
1206

## Electric Swing on 2½-cu. yd. Shovel

**Manufacturer:** Harnischfeger Corp., Milwaukee, Wis.

**Equipment:** Smaller shovel with the "Magnetorque" swing.

**Features claimed:** Heretofore available only on the larger P & H Model 1055 (3 to 4 cu. yd.), "Magnetorque" electro - magnetic type swing mechanism is now available on the model 955-A (2½ to 3 cu. yd.). Features of the electric swing are: Elimination of all friction on swing and propel motions; smoother, more responsive swinging; more accurate and faster starts and stops; a virtual end of maintenance costs. Like all shovels of this line, the model 955-A is of all-welded construction of rolled alloy steels and has simplified heavy-duty hydraulic control. It is easily converted for four types of service: Shovel, dragline, crane and clamshell.



1207

## Combination Trailer Gooseneck and Loading Ramp

**Manufacturer:** Martin Machine Co., Kewanee, Ill.

**Equipment:** A patented Folding Gooseneck which, when lowered to the ground, forms a loading ramp.

**Features claimed:** In operation, the Folding Gooseneck is lowered to form a loading ramp which provides a uniform incline from the ground to the trailer platform. This new method of front loading a "Carryhaul" Trailer of low platform height provides greater clearance for viaducts, bridges and wires, allowing fast and safe movement between jobs. When the trailer is loaded, a power-operated winch on the truck-tractor raises the gooseneck to towing position. The entire procedure is a one-man operation. An additional feature of this trailer is the patented tandem axle assembly which is completely suspended in rubber for flexibility and independent wheel action. This assembly has no grease fittings, requires no lubrication and has no pins or bushings to be replaced.

1208

## Bituminous Distributor

**Manufacturer:** E. D. Etnyre & Co., Oregon, Ill.

**Equipment:** Distributor with stainless steel jacketing and 3,500-gal. capacity.

**Features claimed:** The "Black Toppers" were engineered to take a maximum load and yet comply with weight requirements

of the states in which they will be used. Basically, each machine is an Etnyre FX-400 Style D Distributor having low pressure burners and a 24-ft. full circulating spray bar with relieving sections. The tank proper is 32 ft. 6 in. long with heating flues running the entire length of tank. The equipment is mounted on a specially engineered highway tandem axle semi-trailer.

1209

## 6-Cylinder Diesel Engine

**Manufacturer:** Cummins Engine Co., Inc., Columbus, Ind.

**Equipment:** Engines designed for on-highway and off-highway automotive applications and with a maximum rating of 175 h.p. at 2,000 r.p.m.

**Features claimed:** Features of the HRBB-600 (highway) and HRBBI-600 (off-highway) are: Fully balanced crankshaft, camshaft of new design, viscous-type torsional vibration damper and reviser fuel pump. Both engines have a piston displacement of 743 cu. in., a 5⅛-in. bore, and a 6-in. stroke. The two models are supplied with the following standard equipment: Air cleaner, oil-bath type (unmounted); electrical equipment—12/24-volt, 700-watt; flywheel housing, SAE No. 2 with SAE No. 3 arms;


Real STRIKE-OFF ADAPTABILITY

LOOK at this job! Here was a case where, to maintain the crown of the pavement, a blended or feathered edge was required on the left-hand course.

Simple adjustments take care of these things in the Adnun Black Top Paver. Pavement edges can be feathered to handle widening or they can be sharp and firm. The Cutter Bar can be tilted to ride on the heel—a distinct advantage with some materials.

Bevel, renewable teeth provide an initial compression and the overlapping action of the cutter bar carries material up to the parallel course and compresses it for a tight joint.

End gates can be raised for bleeding or for feeding material to cutter bar extension and the power cut-off permits shutting off the flow of material to the subgrade, eliminating tag-end runouts and making it possible to carry material over intersections.

In addition to this the Adnun lays sand, stone and cinder as well as Asphalt. There never was such flexibility offered in a Black Top Paver.

**THE FOOTE COMPANY, INC.**

1940 STATE STREET — *Subsidiary of Blaw-Knox Co.* — NUNDA, NEW YORK

- **Hydraulic Controls**—for easy handling.
- **Continuous Coarse Correction**—corrects irregularities with successive courses.
- **Powerful Six Cylinder Engine**—power to handle the heaviest truck.
- **Four Wheel Drive**—for better traction.
- **Cutter Bar**—overlaps and compacts joint—"crowds" and compacts materials.
- **Power Cut-Off**—permits carrying load over intersections and eliminates tag-end runouts.
- **End Gates**—permit feeding material out to sides with cutter bar extension.
- **Screed Heater**—assures better handling of material.
- **Crowning Adjustment**—for any crown or bank.
- **Either Rear Roller**—can be disengaged for quick turning.
- **Hopper**—big, adjustable for narrow pavements.
- **Sturdy, Heavy Construction**—that stands the strain of work without constant rebuilding.
- **Adnun Carryall**—easily attached, makes moving up on jobs easy.

A BLAW-KNOX PRODUCT

ADNUN

TRADE MARK REGISTERED

BLACK TOP PAVER

exclusive Cummins fuel pump; fuel oil filter; fuel oil pressure gauge; governor; lubricating oil pressure gauge; lubricating oil strainer, full-flow type; thermostats, with main and by-pass control.

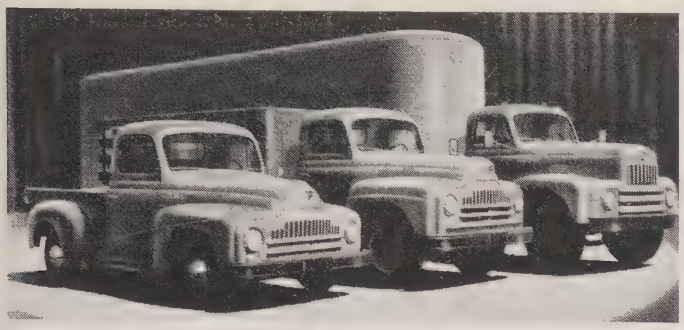
1210

### Completely New Line of Trucks

**Manufacturer:** Motor Truck Division, International Harvester Co., Chicago, Ill.

**Equipment:** A completely re-designed and re-engineered line of International trucks.

**Features claimed:** International has spent more than $30,000,000 for the vast production changeover necessary to produce the new L-line of trucks. The complete L-line consists of 87 separate truck chassis models designed to handle every conceivable type of hauling job. Features of the line are: Complete restyling that blends a modern truck streamlining with extreme practicability; a new "Comfo-Vision" cab, custom-designed to provide more roominess, added comfort and new all around visibility; new chassis dimension engineering that permits better load distribution, greater maneuverability, shorter over-all lengths and improved engine accessibility; new improved valve-in-head International truck series engines, including an all-new Silver Diamond engine, and a host of new mechanical and engineering improvements designed to effect important cost reductions for the operator. Illustrated is the new Loadstar truck Model L-194. This model has a gross vehicle weight rating of 25,500 lb. L-line models range from 4,200 to 40,000 lb. gross vehicle weights.



1211

### Electric Hoists

**Manufacturer:** Harnischfeger Corp., Milwaukee, Wis.

**Equipment:** P & H Zip-Lift Hoists.

**Features claimed:** Illustrated is the way one contractor utilized two Zip-Lift hoists for a building job. One hoist, a 500-lb. model, is bolt-mounted to a portable support. After a chain sling is attached to a wheelbarrow, a workman on the upper level simply pushes a button to raise the load. When it has been raised, the wheelbarrow is swung over to the scaffolding by means of a lever. The other hoist, a 1000-lb. model, operates on a 30-ft. swinging jib which enables it to serve any point in a 60-ft. line. This hoist is used to lift heavy stone for copings, window trim, etc. Push-button control enables the workmen to raise the stone and place it in its exact position. Heavy manual lifting is virtually eliminated by the hoists, and material supply is greatly speeded. P & H Hoists are available for service in all types of construction.

1212

### Loader-Bulldozer Unit

**Manufacturer:** Southwest Welding & Mfg. Co., Alhambra, Calif.

**Equipment:** Unit that is easily convertible as a loader or bulldozer.

**Features claimed:** With only one tractor and a minimum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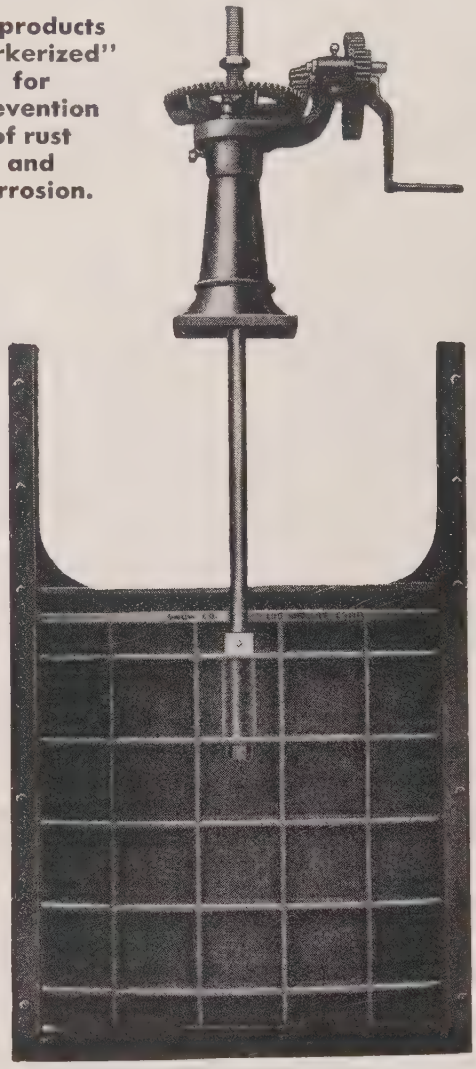
**Gates manufactured in sizes up to 72″ by 72″.**

**Designs in all cast-iron specifications.**

**All products "Parkerized" for prevention of rust and corrosion.**



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(Div. of Bardco Mfg. & Sales Co.)

**2450 EAST 23RD STREET, LOS ANGELES, CALIFORNIA**

number of conversion parts, it is possible to make change-overs in as little as 30 min. The unit is extremely easy to operate and has proved its exceptional value on all types of construction and maintenance jobs. Highway and street maintenance, housing and park projects, and sand and gravel hauling are a few of the jobs it can handle.

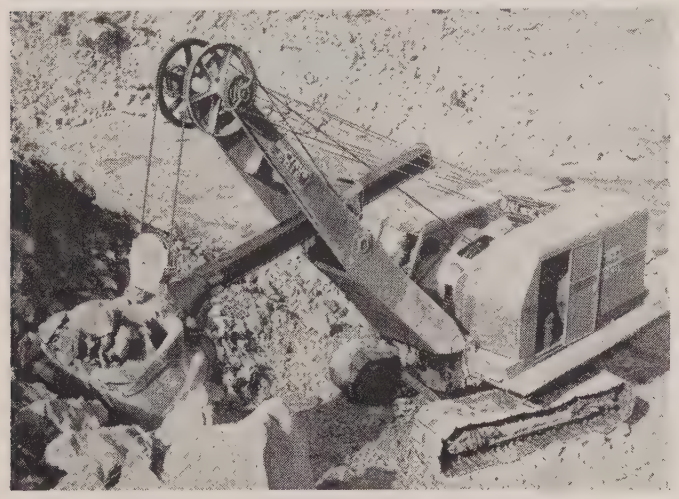
**1213**

## Power Shovel

**Manufacturer:** Bucyrus-Erie Co., South Milwaukee, Wis.

**Equipment:** The new 51-B model with 2-cu. yd. capacity important front end features.

**Features claimed:** Convertible in the field for crane, dragline, clamshell or shovel service, the 51-B will meet the demands of



general contractors needing an all-purpose machine. The single unit inside dipper handle of the new 51-B is similar to other of the company's machines. The twin-rope crowd is fully independent of hoist. Full engine power may be applied to the crowd if necessary. Direct mechanical control of crowd, hoist and swing gives an exceptionally fast digging cycle. Crane booms may be purchased up to 110 ft. in length. With a 60-ft. boom at a 30-ft. working radius, the 51-B will handle 28,000 lb.

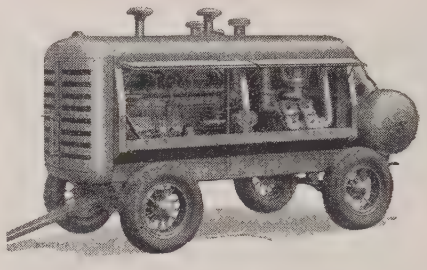
**1214**

## Portable Air Compressor

**Manufacturer:** Ingersoll-Rand Co., New York City.

**Equipment:** The New IKA 5-cu. ft. per min. Diesel-driven compressor.

**Features claimed:** The compressor has all the features used on Ingersoll-Rand's Series Mobil-Air compressors in sizes from 105- to 500-cu. ft. per min. The new Floating-Speed Regulator slows down the compressor to the lowest practical working speed that compresses just enough air to hold the pressure. Full 500-cu. ft. per min. capacity is delivered at rated 100-p.s.i. pressure. The engine is the International-Harvester heavy-duty UD-24 which starts easily as a low-compression gasoline engine and after a short warm-up period is shifted to full Diesel operation by means of a single lever. Other features include Two-Stage Air-Cooled Compressor, Hydro-Shift Flex-Disc Clutch, Channel Valves and sturdy running gear and mountings.



**1215**

## Snow Plow Wax

**Manufacturer:** Pennsylvania Refining Co., Cleveland, Ohio.

**Equipment:** An improved grade of Penn Drake Snow Plow Wax.

**Features claimed:** Easily applied with either paint brush or spray gun, the new wax provides a heavier and longer lasting slippery coat for the working surfaces of snow removal equip-


NEW... Rocker Dump Attachment on GAR·BRO concrete carts

Rocker attachment on the GAR-BRO Type R Rocker Dump-Cart eliminates roll-back of the cart when dumping. Especially efficient for handling dry or stiff concrete. Other cart features: (1) body has no inside welds; (2) supporting member of axle is a steel channel bent around bottom and bolted to tray; (3) tray is flanged for stiffness; (4) wheels are steel spoked with depressed hubs to permit passing on runways; (5) wheel bearings are 4 inch length roller bearings; (6) 4.00 x 18, 4-ply pneumatic tires; (7) pulling bail welded to tray bottom. Write GAR-BRO Manufacturing Co., 2416 E. 16th St., Los Angeles 21, Calif.

*Rocker can be furnished as a separate item for attaching to any GAR-BRO Concrete Cart.*

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GAR·BRO

ment. The tough wax coating is said to be up to 50% thicker than formerly provided. It is especially effective on high speed equipment, and makes faster snow removal possible.

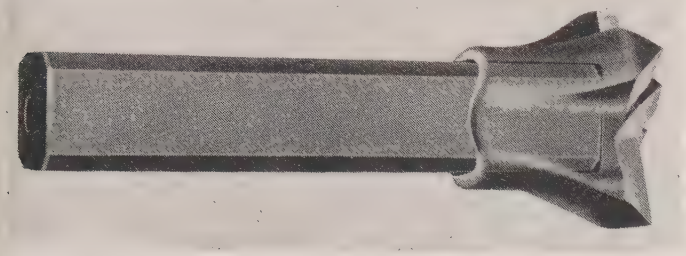
1216

## New Type Rock Drilling Bit

**Manufacturer:** Timken Roller Bearing Co., Canton, Ohio.

**Equipment:** Timken's One-use "Spiralock" bit.

**Features claimed:** The new bit is intended primarily for use where bit reconditioning is impractical or undesirable and is de-



signed for fast drilling at low cost. The new bit has a square socket that spirals slightly as it recedes, forming the "Spiralock" union that prevents the bit coming off the steel in the hole. The back face of the bit is scalloped and rounded off to prevent chips packing behind the bit. The "X" cutting edge of the bit prevents rifling in any ground. Existing drill steels of any size and section can be easily and quickly adapted to the new bit. It is easy to put on and take off.

1217

## Surface Material Spreader

**Manufacturer:** Gabb Mfg. Co., East Hartford, Conn.

**Equipment:** A spinner disc-type spreader that spreads surfacing material ahead of the truck.

**Features claimed:** Outstanding feature of the unit is that the road surfacing material can be spread ahead of the truck. This patented feature has many obvious advantages, and is accomplished by means of a rubber conveyor belt that brings materials forward underneath the truck. Sand, cinders, crushed stone and

trap rock, up to ¾ in., can be handled with ease. The operator rides on the front platform of the machine where he can watch and control the quality of a resurfacing job. The width of the spread can be varied from 4 to 20 ft., and the density of the spread can be controlled by simply changing the conveyor belt speed by means of a variable speed transmission. Controls are also provided to permit control of the spread to either the right or left of the machine, insuring uniform coverage as desired. The machine is quickly attached to the truck by means of chains and a hydraulic lift system.

1218

## Swing Loader

**Manufacturer:** Mandt Mfg. Co., Columbus, Ohio.

**Equipment:** Loader that can be quickly converted to mobile crane or backhoe operation.

**Features claimed:** As a loader, the unit is designed for standard ¾-cu. yd. material bucket and up to 2-cu. yd. snow bucket. It is capable of loading from any point in a 10-ft. wide swath and also above grade, and it can swing 90 deg. to either side to dump, permitting work within 2 ft. of trucks and eliminating the backing and turning operations required in ordinary loader operation. The main weight of the machine and all the leverage of its load are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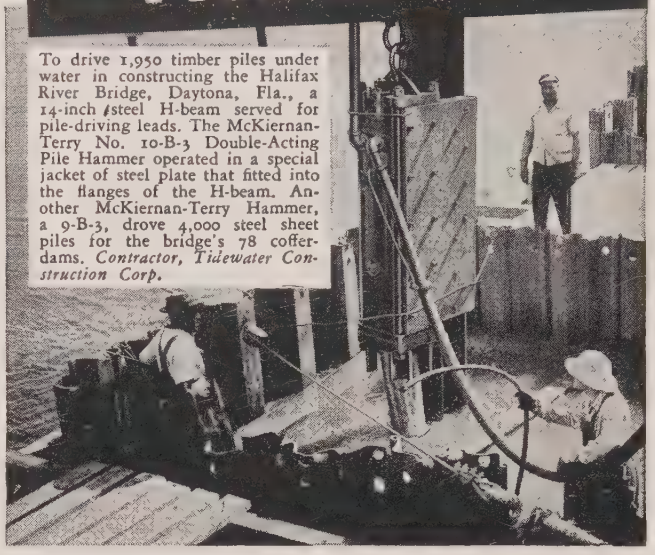

To drive 1,950 timber piles under water in constructing the Halifax River Bridge, Daytona, Fla., a 14-inch steel H-beam served for pile-driving leads. The McKiernan-Terry No. 10-B-3 Double-Acting Pile Hammer operated in a special jacket of steel plate that fitted into the flanges of the H-beam. Another McKiernan-Terry Hammer, a 9-B-3, drove 4,000 steel sheet piles for the bridge's 78 cofferdams. *Contractor, Tidewater Construction Corp.*

Necessity mothered the invention of this novel pile-driving procedure, for here were conditions where conventional pile driver leads could not be used.

Past experience with McKiernan-Terry Hammers occasioned the selection of these hammers for the job.

Power, dependability and safety of operation, demonstrated for over fifty years on pile-driving projects of every description, all over the world, have made McKiernan-Terry Pile Hammers the No. 1 choice of leading contractors and engineers. They can always secure in the standard McKiernan-Terry line of ten double-acting hammers, five single-acting hammers and two double-acting pile extractors a hammer or extractor powered for any specific requirements.

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Coal and ore bridges, bulk material unloaders, bridge operating mechanisms, hoists and marine equipment are among the many other important products of McKiernan-Terry engineering and manufacturing skill, performing important service to industry, the railroads and our government. MK-269 B

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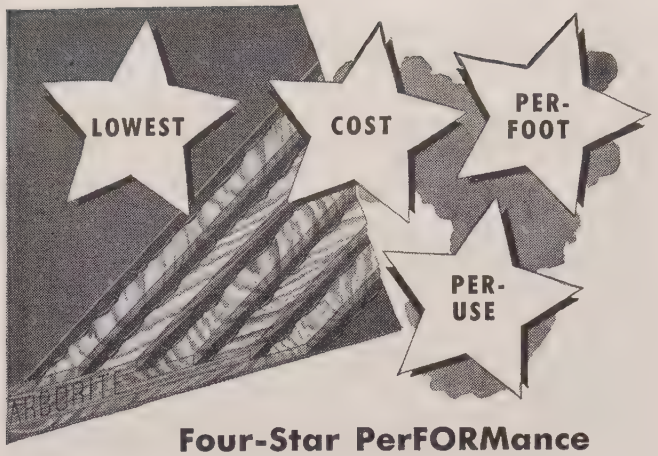
PILE HAMMERS AND EXTRACTORS

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The Superior Multiple Re-Use Concrete Form Panel

**These four-star features make Harborite today's leading concrete form panel**

1. Hard, check-free, durable overlay faces—for near-perfect concrete surfaces.
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**SPECIFY HARBORITE**—the concrete form panel which can be used again and again until literally worn away. Harborite sizes—Widths: 36" to 48"; Lengths: 96" to 144"; Thicknesses: ¼" to 1 9/16". Thickness tolerance: 1/64". Edge-sealing and mill-oiling optional.

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★ ★ ★ SUPER-Harbord PLYCRETE—Grade-marked: EXT • DFPA • AA. For multiple re-use form work. Hot-press-bonded with phenolic-type resin adhesive. ALL veneer jointed. All open defects in crossbands repaired. Rehumidified after pressing. Sanded smooth both sides. Edge-sealing and oiling optional.

★★ Harbord PLYCRETE—Grade-marked: INTERIOR • AA • DFPA. Harbord PLYCRETE has the same veneer faces as SUPER-Harbord Plycrete, but is bonded with 10-cycle moisture-resistant glues instead of waterproof adhesives. Sanded smooth both faces. Will withstand many re-uses. Factory edge-sealing and oiling optional.

★ Harbor PLYFORM—Grade-marked: PLYFORM • DFPA • BB. Bonded with water-resistant 10-cycle glues (not waterproof). Both faces are BB (solid) veneer, free from open defects. Sanded smooth. Factory edge-sealing and oiling optional.

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centered on the 4 driven front wheels for maximum traction and crowding power. The bucket is provided with power dump and return. Utility is increased by installation of a ⅓-cu. yd. backhoe attachment in place of a loader, or to a mobile 3-ton crane operating boom of 10 to 23-ft. length which can be swung 180 deg without outriggers to pick up or place loads.

**1219**

## Rear-Dump Euclid

**Manufacturer:** The Euclid Road Machinery Co., Cleveland, Ohio.

**Equipment:** The Model UD, with a struck measure of 6.6 cu yd. and a 10-ton payload capacity.

**Features claimed:** Powered by a 125-h.p. Diesel engine, the Model UD is designed for heavy off-the-highway hauling. It is

built to the same rigid standards of construction throughout as the larger capacity models and incorporates such features as the Euclid planetary drive axle, 10-speed heavy-duty transmission, three-stage double-acting hydraulic hoist, and free-floating spring mounting for front and drive axles. Top speed with capacity payload is 35.7 m.p.h.

**1220**

## Hystaway Shovel Front

**Manufacturer:** Hyster Co., Portland, Ore.

**Equipment:** A ½-cu. yd. shovel front for the tractor-mounted Hystaway.

**Features claimed:** This new attachment for the Hystaway may be mounted on either new or used machines without major alterations. Features of the unit include ample power, fast swing,

long reach, and absence of tail swing. Because of the maneuverability of its tractor base, the excavator can get into and work jobs difficult for the average shovel to handle. It is well adapted for such jobs as road grading, gravel pit excavation, etc. Designed only for the "Caterpillar" D7 and D8 track-type tractors.

**1221**

## Trenching Attachment

**Manufacturer:** The Oliver Corp., Cleveland, Ohio.

**Equipment:** Ware Hydro-Trencher attachment for either a Model "77" or Model "88" Oliver Wheel Tractor.

**Features claimed:** This inexpensive unit has two hydraulic outriggers that provide a sturdy base for the entire combination and remove strains from the tractor while digging. The front of

the tractor is held in place by counterbalancing weights. The boom is hydraulically operated and swings to either side allowing placement of earth in any desired location. The backhoe can be changed to a conventional shovel bucket for loading operations, or the entire trencher unit can be quickly removed and the tractor used for other duties.

1222

## New Line of Trucks

**Manufacturer:** Dodge Division, Chrysler Corp., Detroit, Mich.

**Equipment:** The Dodge "Job-Rated" truck line comprising 356 basic models.

**Features claimed:** The "Job-Rated" line now ranges from 4,250 to 23,000 lb. gross vehicle weight and up to 40,000 lb. gross combination weight to meet more than 97% of all hauling needs. The broadened coverage includes conventional truck models, dual purpose models, cab-over-engine models, cab-over-engine dual purpose models and the 4-wheel drive Power-Wagon. Among the new features announced on the new B-2 series are: An electrical system which assists in improved engine performance, a new 5-speed synchro-shift transmission, a new 5-speed synchro-shift overdrive transmission, cyclebonded brake linings as standard equipment on all models, a steering column gearshift and a convenient hand brake under the center of the cowl on ½, ¾ and 1-ton models. Largest truck offered by Dodge in the new B-2 series is the VA-130 model with a rating of 23,000 lb. gross vehicle weight and 40,000 lb. gross combination weight. This model is offered in five wheelbases. It has a 331-cu. in. engine, sodium-cooled exhaust valves, silent helical 5-speed transmissions with overdrive in fifth available, a new electrical system which improves engine performance, and steel spoke wheels which reduce unsprung weight and improve brake cooling.

1223

## Traffic Zoning Paint

**Manufacturer:** Thomson-Porcelite Paint Co., Philadelphia, Pa.

**Equipment:** Paint with unusual resistance to stains and scuffing.

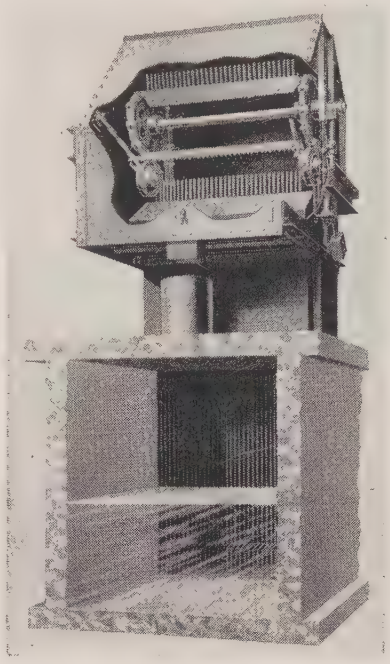
**Features claimed:** Porcelite traffic zoning paint withstands all types of traffic from the heaviest machine load to plain foot traffic. It dries hard so quickly that in 20 to 30 min. after application the heaviest truck can run over lines without the slightest harm to the markings. One coat, applied by hand or machine does the job; and for surfaces of creosote block a special non-bleeding primer is available.

1224

## Bar Screen

**Manufacturer:** Link-Belt Co., Chicago, Ill.

**Equipment:** New type screen for efficiently removing trash and large solids at water, sewage and industrial waste treatment plants.



**Features claimed:** The primary elements of the Thru-Clean Screen are a permanently supported rack of vertical steel screen bars and power operated screen-bar-cleaning mechanism employing two endless parallel strands of "C" Class Combination chain between which are fastened two or more steel rakes at evenly spaced intervals. The rake teeth engage the screen bars through the screen rack from the downstream side, and are moved upwards through the screen bars to the discharge point—where the screenings are discharged by a pivoted counter-weighted mechanical wiper plate. The screenings are discharged on the upstream side of the screen rack to a belt conveyor for disposal elsewhere, or into a trough from which they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Your investment in anti-friction bearings is certainly great enough to warrant your investigating the possible savings to be made through the use of LUBRIPLATE lubricants. They actually preserve bearing surfaces, arrest progressive wear and protect against rust and corrosion. There are LUBRIPLATE lubricants for all speeds, all operating temperatures and conditions.

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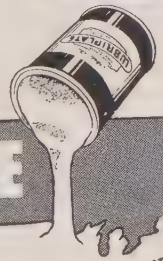

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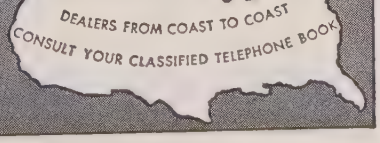


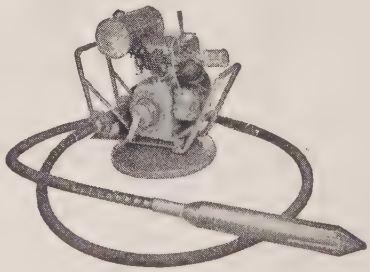

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which have made them highly successful all over the world.

DEPENDABLE FLEXIBLE DRIVE. All sections are interchangeable, in multiples of 7' and 12' lengths. No special sections are required. Each casing has ball bearing connector. Each alloy steel core has slip joint which does not separate in service. It prevents stretching and overheating. No limit to length of drive.

RELIABLE VIBRATING HEADS. Also interchangeable and can be applied to any drive section. Heads can be opened for repairs. Rotor mounted on double row ball bearings. Alloy steel external ribs reduce wear.

STANDARD POWER UNITS. Well-known gasoline engines and electric motors. Can be serviced almost everywhere.

CONCRETE GRINDERS. Speed reducing heads, to hold wheels, can be attached to any drive section.

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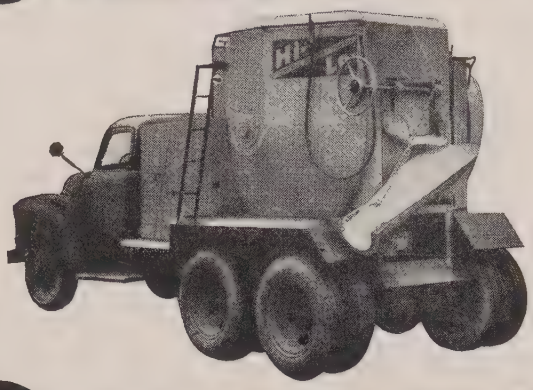
Hi-Lo
CONCRETE TRANSPORT MIXER CO.
TRUCK MIXER
Hi- DISCHARGE PRODUCTION SPEED PROFITS!

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can be raked by hand into either a shredder or a screening-can located directly under the steel plate enclosure of the head of the machine. The machine is operated by a Gearmotor and encased "RC" roller chain drive connecting with its head shaft. The operation may be automatic by means of a time clock, or manually by push buttons.

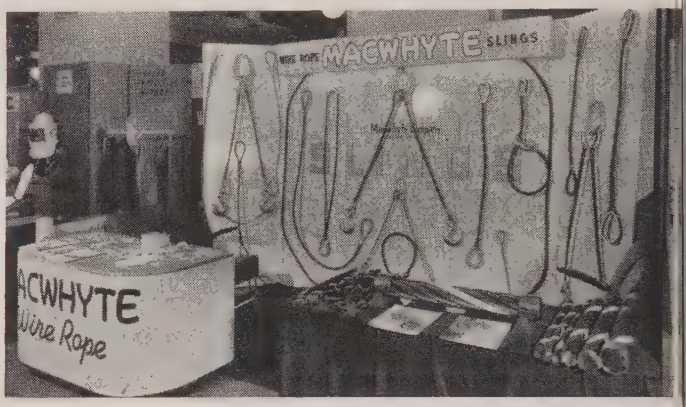
1225

### Wire Rope and Slings

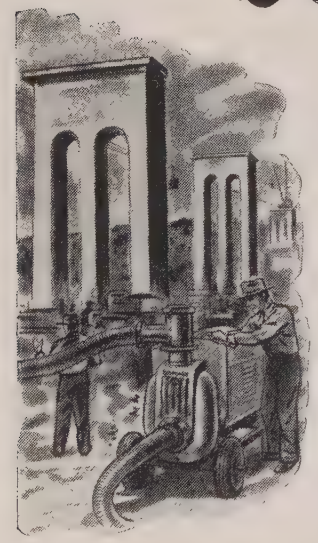
**Manufacturer:** Macwhyte Co., Kenosha, Wis.

**Equipment:** A variety of slings, and wire ropes having various fittings.

**Features claimed:** At a recent exhibition, Macwhyte exhibited an extensive collection of wire ropes and slings (exhibit illustrated). Included in the display were slings made from endless




wire ropes in round braided and flat braided types, a variety of slings made from a single part of rope, and wire ropes having various fittings, such as hooks, shackles, stud ends, and clevis ends, swaged to the rope for permanent attachment. Much interest was shown in the extreme contrast between the very small cords and the larger ropes. Largest rope shown was 3⅛-in. diameter, weighing 16.65 lb. to the foot and having a strength of approximately 392 tons.

THE Best Pump

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# LITERATURE FROM MANUFACTURERS...

*Copies of the bulletins and catalogs described in this column may be had by addressing a request to the Western Construction News, 609 Mission Street, San Francisco 5, California.*

**1226**

SLOW-SPEED ELECTRIC POWER MOTORS—**Sterling Electric Motors,** Los Angeles, has published a 4-page bulletin explaining by specifications and cut-away illustrations how the Sterling Slo-Speed geared motors eliminate line shafting, pulleys, belts, sprockets and attendant plant troubles. The folder explains how Sterling motors and Sterling gears are combined in a balanced design from power intake to drive shaft for every horsepower rating, and therefore assure long, dependable service at the "one best" constant slow speed.

**1227**

JAW CRUSHERS WITH PATENTED HYDRAULIC ADJUSTMENT—**Gruendler Crusher & Pulverizer Co.,** St. Louis Mo., has published its Bulletin No. BM-10 describing the firm's entire "Series 10" line of jaw crushers. The bulletin explains how the crushers are equipped with self-aligning roller bearings, heavy-duty manganese jaws and cheek plates, and the new Shelton patented hydraulic jaw adjustment that enables the operator to adjust the jaw crusher while in operation in less than one minute, eliminating all of the difficulties of the old style wedge and screw mechanisms.

**1228**

EARTHMOVING EQUIPMENT IN SOIL CONSERVATION—The leading role of earthmoving contractors and their equipment in the nation-wide battle to protect, improve and expand America's productive farm and range lands is dramatically portrayed in a documentary 12-page, 2-color booklet published by **International Harvester Co.,** Chicago. Action photos of tractors on the job illustrate various operations involved in soil saving. Many other phases of the work are shown. Brief captions give job details, costs and owner reports of tractor performance.

**1229**

SPECIAL ALLOY STEEL FOR CONSTRUCTION INDUSTRY—**Jones & Laughlin Steel Corp.,** Pittsburgh, Pa., has available a 36-page brochure entitled "For Longer Wear, Less Repair" and describing Jalloy. Jalloy is a new special alloy steel capable of being heat-treated to excellent physical properties for use in the mining, quarrying, and earthmoving industries, and where abrasion and impact resistance are major factors in the service life of steel. Included in the illustrated booklet is a complete table with data on chemical composition, grain size, and physical properties relating to surface hardness and yield strength.

**1230**

SWING-LOADER, CRANE, BACKHOE—**Mandt Manufacturing Co.,** Columbus, Ohio., has available an 8-page illustrated folder describing their latest hydraulically powered loader, handling from a ¾-cu. yd. standard material bucket up to a 2-cu. yd. snow bucket with 180-deg. swing. Attachments provide conversion to mobile yard or factory crane operations.

**1231**

WALL-FORM SYSTEM — **Symons Clamp & Mfg. Co.,** Chicago, Ill., has published a 34-page catalog describing a new system of wall-form construction. Illustrations show in detail the operation of the forming system. Actual job reports show the form in use, and include blueprint illustrations, specifications, material and equipment needed, and time and cost figures.

**1232**

BRONZE GATE VALVES—**Kennedy Valve Mfg. Co.,** Elmira, N. Y., has released a folder describing two of their standard bronze gate valves, Figures 27 and 30. Design features are explained in detail with a large sectional drawing of the valve. Ratings, sizes, and dimensions are included.

**1233**

PUBLIC UTILITIES POWER — **Caterpillar Tractor Co.,** San Leandro, Calif., has released an 8-page illustrated booklet describing the varied application of equipment and engines in the field of public service. Entitled "Public Utilities," the booklet emphasizes the wide use of Diesel power in the business of laying new power lines, stringing telephone wire, laying gas pipe, or handling large amounts of coal.

**1234**

PRECAST CONCRETE PILES—**Ben C. Gerwick, Inc.,** contracting and engineering firm of San Francisco, has published an extremely attractive, 8 x 11 loose-leaf booklet entitled "Standard Specifications and Designs for Precast Concrete Piles." Drawing on a broad experience of working with precast concrete piling, the firm has taken this opportunity to outline specifications and drawings that should satisfy the requirements of normal foundations using this type of piling. Following the section devoted to the specifications, photographs of typical Gerwick-engineered installations


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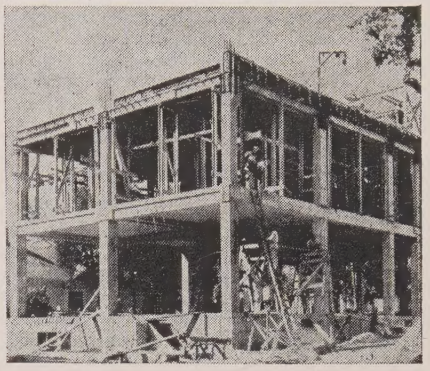

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of precast concrete piling are included. The booklet points out that precast concrete piles are being increasingly used for buildings, wharves and other structures, both on land and in water, because of the following advantages: (1) Durability and permanence; (2) Fire-proof; (3) High capacity, due to large area in skin-friction and in end-bearing; (4) High resistance to lateral loads, and (5) Economy—Low cost per ton of load carried.

**1235**

HOISTING TOWERS — **Beaver Art Metal Corp.**, Ellwood City, Pa., has just released a four-page folder describing their heavy and light duty tubular steel hoisting towers. Details of joint construction are featured for both the 5,000-lb. and 3,200-lb. towers in the illustrated folder.

**1236**

ANTI-FREEZE—Publication of a new leaflet describing Freez-Rem, an alcohol type anti-freeze, is announced by **Speco, Inc.**, Cleveland. The leaflet lists Freez-Rem features of high boiling point, extra protection and low cost, and a protection chart showing quantities of the fluid needed to freeze-proof cars at various temperatures.

**1237**

HOSE COUPLINGS — **Hose Accessories Co.**, Philadelphia, Pa., has released a four-page bulletin describing the complete line of LE-HI suction and water hose couplings. Included are illustrations of hose combination male hose nipples, brass and malleable suction and water hose coupling, hose pipe, and adapters.

**1238**

SCRAPER OPERATIONS—**Caterpillar Tractor Co.**, San Leandro, Calif., has available a 16-page booklet containing cutaway illustrations with data and information explaining certain features on its scrapers that enable them to do a good job of earthmoving. Entitled "Caterpillar Scrapers Are Profit Makers," the booklet also shows scrapers at work on various jobs, along with information from contractors and owners.

**1239**

PORTABLE POWER TOOLS—**Independent Pneumatic Tool Co.**, Aurora, Ill., has for distribution two circulars covering the entire Thor universal electric portable power tool line and the Thor Silver Line 4½-in. universal electric belt sander. Complete data and prices are included.

**1240**

BUCKING SNOW COSTS — This is the title of an 8-page booklet published by the **Caterpillar Tractor Co.**, San Leandro, Calif., to describe the growing use of Diesel power in helping to maintain clear roads, streets, and railroad rights-of-way.

**1241**

SELF-PROPELLED AGGREGATE SPREADER—**Jaeger Machine Co.**, Columbus, Ohio, has just released a 4-page illustrated bulletin describing their self-propelled aggregate spreader for laying base and surface aggregates, free-flowing bituminous mixtures, and plant-mixed stabilized soil.

**1242**

DIESEL POWER DELIVERY — **Cummins Engine Co., Inc.**, Columbus, Indiana, has available a 12-page folder illustrated in color and describing the operating characteristics of the Cummins models NVHS-1200 and NVH-1200 engines. In addition to drawings and field photographs of the units, the folder lists condensed specifications and data on torque, horsepower, and fuel consumption.

**1243**

LIFT TRUCK ACCESSORIES—**Hyster Co.**, Portland, Ore., has just released a 28-page book with photographs and descriptions of their attachments, tools, and accessories for the Hyster lift trucks, Karry Krane, and straddle trucks. The catalog lists over 60 additions to equipment, with examples of applications and brief descriptions.

**1244**

ONE-CYLINDER DIESEL ENGINE—**Nordberg Mfg. Co.**, Milwaukee, Wis., announces publication of 4 new bulletins on its new one-cylinder 4½ x 5¼-in. Diesel engine. The bulletins give specifications, detailed information and outline drawings of Nordberg Model 4FS-1 Diesel engines as adapted to power take-off with and without clutch, generating units and pumping units.

**1245**

CORROSION-RESISTING WIRE ROPE—A bulletin published by **Macwhyte Co.**, Kenosha, Wis., points out that stainless steel and monel metal wire ropes are becoming more popular where corrosion affects uncoated carbon steel and galvanized ropes. A total of 133 different sizes and types are catalogued in the new folder. Typical uses for each rope are listed and the various types available are described and illustrated.

**1246**

SAFETY BELTS—**E. D. Bullard Co.**, San Francisco and Los Angeles, has published a bulletin entitled "Reduce Accidents and Absenteeism with Bullard Job-Fitted


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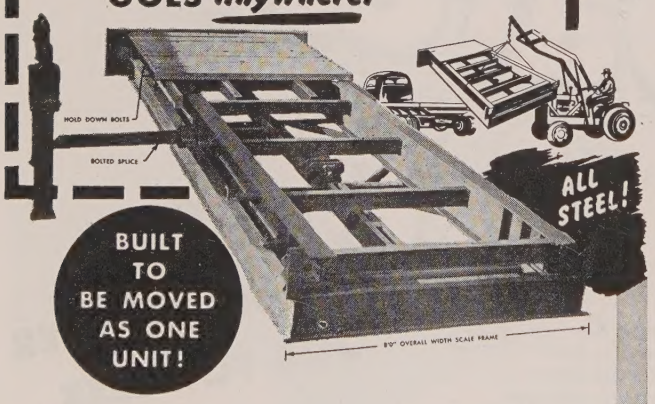


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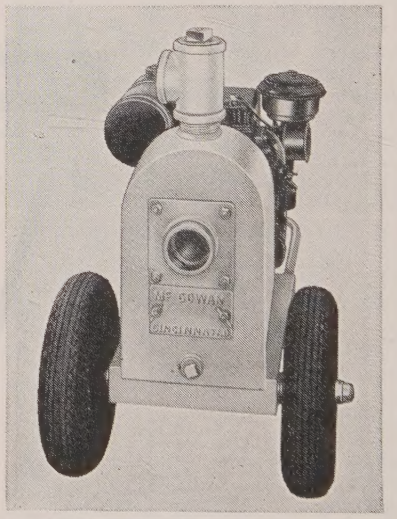


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Safety Belts." Five different types of safety belts are described and pictured—the Morenci Safety Belt, the Harness Type, the Marine Type, the Construction Type and the Saddle Type. The bulletin explains that the belts are field tested under actual working conditions.

**1247**

SEWAGE AND INDUSTRIAL WASTE TREATMENT—An attractive new 24-page manual entitled "Modern Processes and Equipment for Sewage and Industrial Waste Treatment" has been published by the **American Well Works,** Aurora, Ill. Indexed and classified by treatment processes, the manual graphically illustrates and describes American processes and equipment. It includes the latest engineering developments from the firm's laboratories as well as those which have long been standard in large and small plants. It includes Activated Sludge, Bio-Activation, Jet Aeration, Screening, Grit Removal, Pre-Treatment, Sedimentation, Trickling Filters, Sewage and Sludge Pumping, Industrial Waste Treatment and Recovery, Flow Sheets and Installation Views.

**1248**

HUBER MAINTAINER — **Huber Manufacturing Co.,** Marion, Ohio, has published a 16-page, 2-color bulletin explaining how the Huber Maintainer's several front-end attachments can be used for a wide variety of construction and maintenance applications. The 42½-hp., 6,000-lb. "All-Purpose" unit can be operated as a grader, berm leveler, road planer, bulldozer, lift-loader, snow plow, highway mower, one-way broom and patch roller.

**1249**

WESTERN RED CEDAR AND SITKA SPRUCE LUMBER—The second and third in a series of species pamphlets have been published by the **West Coast Lumbermen's Association,** Portland, Ore. Attractively printed in 2 colors, with numerous illustrations, the 8-page pamphlets briefly describe the properties and uses of lumber manufactured from the two species by West Coast sawmills.

**1250**

EARTHMOVERS IN ACTION—An action-photo review of International crawler and wheel tractors in a wide variety of dirt moving operations is presented in an attractive 2-color, 12-page pamphlet issued by **International Harvester Co.,** Chicago, Ill. Models ranging from the 19-ton TD-24 of 140 drawbar horsepower to the 44-drawbar horsepower ID-9 are shown in typical jobs with matched mounted or drawn equipment. Brief captions give work details and other reports of tractor performance.

**1251**

UTILITY DITCHER—**Findlay Division of Gar Wood Industries, Inc.,** Findlay, Ohio, has published an 8-page color bulletin on the Buckeye Model 305 Utility Ditcher. The new bulletin emphasizes the many features of the ditcher and lists the varied applications.

**1252**

DOUBLE IMPELLER BREAKERS —A new 16-page catalog describing its five models of Double Impeller Breakers has been published by **New Holland Manufacturing Co.,** Mountville, Pa. A 4-page section is devoted to a description of the principle of dual impact action and how it is built into the Double Impeller Breakers. Cutaway drawings show how stone is reduced to desired sizes by impact in suspension with twin whirling impellers inside the breaking chamber. Another section illustrates the Double Impeller Breaker installed as skid-mounted units and as a part of one and two-unit semi-portable and portable crushing and screening plants.

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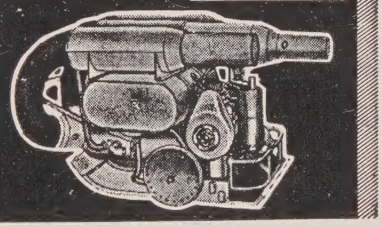

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